MAXIMUM PC

2005 BUYER'S GUIDE

HONEST REVIEWS

of PC hardware, software, and gadgets...

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receive *Maximum PC*'s coveted Kick-Ass award

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help you make the best buying decisions

que

BY GEORGE JONES

MAXIMUM PC

2005 BUYER'S GUIDE

BY GEORGE JONES

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800 East 96th Street,
Indianapolis, Indiana 46240

Maximum PC 2005 Buyer's Guide

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Foreword: Maximum PC: How It All Began

I must humbly confess that when I first heard about *boot*—the magazine from whence *Maximum PC* originated—I was living life as a Macintosh user. Yeah, I know. Them ain't easy words to hear from the former editor-in-chief (and current editorial director) of the world's preeminent bible for hardcore PC enthusiasts. But a Mac user I was. For a stint of about 18 months.

Oh, sure. My first computer was a 286. And then I leap-frogged to a 486 when I started doing graphic design for a software company in South San Francisco. But when I took the job of managing editor at *The Net* magazine in 1995, Imagine Media, my new employer, put me on a Mac. But, hey—*whatever.* A computer was a computer, right?

Well, back then I really didn't know jack about PCs. I hadn't yet explored the fascinating nitty-gritty of PC technology. But that all changed a few months after I took the managing editor gig. On what would ultimately become a fateful day in my story arch, the publisher of *PC Gamer*, Matt Firme, sent out an internal company email, alerting the ranks to Imagine Media's launch of a new magazine—a magazine for hardcore PC hobbyists. The goal was to reach the kind of guys who lived, ate, and breathed PC hardware. The kind of guys who ripped apart and reassembled PCs just for kicks. Just for cheap thrills.

Could anyone recommend an editor-in-chief candidate for this new magazine? Matt needed staff for the new launch, but didn't want to deplete the ranks of *PC Gamer*, the company's most successful title.

Well, I answered the email, telling Matt that one of my former co-workers, Brad Dosland, would be perfect for the editor-in-chief gig. Brad was hired within a few weeks, and about six months later Imagine Media launched *boot* magazine, our homage to "Pure PC Power." And a few months after that, I applied for a transfer, and became Brad's second-in-command, his executive editor. I was hired for my story development skills, my writing voice, and my general, all-around grasp of technology subjects. But I was *not* hired because I was some type of PC hardware guru. I wasn't that guy.

I would, however, have to *become* that guy, and in the end, getting up to speed turned out to be easy. Why? Because when I joined the staff of *boot* magazine, I discovered all the juicy technological riches that PCs have to offer.

I could share many war stories about my trial-by-fire. But the one that sticks out most in my mind concerns *glQuake*, the first 3D game to really take advantage of hardware acceleration. I had only been on the *boot* job for one week when I saw this game running in all its bilinear-filtered glory. Sure, I had seen *Quake* before, but I hadn't yet seen its 3D-accelerated extension. But when I did, I experienced an epiphany: "*This* is why PCs matter! *This* is why PCs rule!"

And then I asked for a copy of the game. Andrew Sanchez, then an associate editor, said he could give me a copy of *Quake*, and instructed me to go online to download id Software's 3D-accelerated executable file. But he also informed me that if I wanted to play the game with filtering enabled, I would need a new videocard.

"Excuse me?"

"Uh, yeah. You'll need either a Rendition card, or a 3dfx card—and if you use the 3dfx card, you'll need a separate 2D card. So make sure you have enough PCI slots."

Jimminy Christmas, what in the world was this guy talking about? Two videocards? PCI slots? Just give me the damn game, I thought.

Well, for the sake of brevity, I'll accelerate the timeline here. Not only did I quickly figure out everything I needed to know about running *glQuake*, I also become a junkie for learning everything possible about PC hardware. I became intent on knowing exactly how CRTs work. I felt incomplete unless I knew the finer details of CPU pipelining. I didn't want to just play the games; I wanted to know which videocards played them the best, and why. For me, PC hardware opened a *huge* world of technology curiosity. And that's why I have always found editing content for *boot* and *Maximum PC* to be so rewarding.

If you've ever suspected that working for *Maximum PC* is a dream job for tech geeks, then you're right. The never-ending stream of new hardware into the Lab is a reward in and of itself. And in the next 200-odd pages, George Jones, the magazine's current editor-in-chief, is going to show you the best—and worst—of the hardware that the *Maximum PC* boys and girls have played with lately. You'll also learn about the coolest hardware on the horizon, get a peek into the magazine's testing process, and learn some institutional secrets along the way.

Enjoy the ride. Thanks for buying this book, and if you're a long-time reader of the magazine, thank you for your tireless and devoted support. We are nothing without our readers.

Jon Phillips, editorial director, *Maximum PC*

Big Daddy Returns to Share the Original Maximum PC Vision

As I was writing the foreword for George's book, I thought it would be cool if every *Maximum PC* editor-in-chief could share a little somethun-somethun about the magazine. So I asked Brad "Big Daddy" Dosland to riff me a few thoughts on his original vision for *boot/Maximum PC.* What follows are Brad's recollections of how it all began. —*Jon Phillips*

"When we first decided to create *boot*, we knew we didn't want it to be just another PC magazine. We didn't want a magazine tailored for corporate buyers who answered to spreadsheets. We didn't want to make a magazine for soccer moms who lived in fear of that thing in the den. We wanted to create the first magazine geared for the hardcore fanatics who had a real passion for technology. These people would have been under the hood, cranking on their big blocks in any other decade. But we knew that, these days, they were overclocking their rigs to deliver obscene PC power. They simply demanded the best from their machines, and from a magazine.

"That's the idea we took into the Lab. Other magazines' reviews were all designed to allow IT managers to recommend whatever cost-cutting crap looked good in their quarterly reports. Of course, these guys wouldn't be caught dead actually *owning* this flotsam. We immediately decided that we would never hesitate to come down hard on any gear that didn't meet our readers' high expectations. And come down hard we did. Again and again, after running a negative hardware review, manufacturers would come back to us and say, 'But the other magazines liked it!' But it didn't phase us, because we always have the raw numbers to back up our harsh words. Hardware vendors—even those that advertised—learned that the only way to get a good rating was to make a good product. In fact, at a time when PCs were becoming a gross commodity, we convinced companies to create quality products. The Kick Ass award given by our editors became the only accolade that mattered to people who really *knew* PCs.

"And we knew the award mattered, because we tested gear hard. Other magazines performed casual tests for casual users. Manufacturers had come to know exactly what would be expected of their equipment during this "synthetic testing," so they actually began engineering their systems to perform well in these meaningless, abstract benchmark tests. But we didn't use the same tests used by competing magazines! Instead, we decided to base our benchmarks on the real-world applications that were familiar with our readers. We tested with real games and applications, in the most extreme conditions. Processors were overclocked, burn speeds were pushed, hardware got hurt.

"We had a motto: 'Test until it breaks or catches fire.' And the local fire department can testify to that, because they were called to the magazine's parking lot to extinguish some of the more extreme testing. We didn't have enormous space or a dedicated Lab staff. In fact, our policy was that all staff writers had to conduct their own Lab tests—no third-party flunkie would conduct such critical and revealing experiments. Despite our limited resources, we still managed to break more stories that protected our readers from scams than any other news source. And we managed to do it all in a voice that was fresh and funny, and sometimes surprisingly candid. It was the same voice our readers spoke.

"And it worked."

About the Author

George Jones is the editor-in-chief of *Maximum PC*. At the tender young age of 10, he discovered his joy for computing—and his fascination with taking computers apart—when his parents made him the happy benefactor of a Commodore VIC-20 computer. George lives in San Francisco with his wife Jane.

Dedication

Big thanks and love to my parents. By giving this inner-city kid his first computer, they created a hardware hacking monster. And to my wife Jane—for her unconditional love, patience, and support.

Acknowledgments

More than anyone else, I owe huge amounts of gratitude to two *Maximum PC* staffers: Tae Kim for gathering each and every photo in this book (whew!), and Josh Norem for writing the "Speakers" and "Hard Drives" chapters. I couldn't have done it without you guys!

I'd also like to thank the *Maximum PC* staff for their patience during the days when my book-filled head was in the clouds, and for their hard work. All of the reviews in this book were written by them, and it is their work ethic and rigorous testing that has made M*aximum PC* the success that it is.

Finally, I'd like to thank my boss, Jon Phillips, and editors Todd Brakke and Rick Kughen—your encouragement and support made all the difference.

We Want to Hear from You!

As the reader of this book, *you* are our most important critic and commentator. We value your opinion and want to know what we're doing right, what we could do better, what areas you'd like to see us publish in, and any other words of wisdom you're willing to pass our way.

As an associate publisher for Que Publishing, I welcome your comments. You can email or write me directly to let me know what you did or didn't like about this book—as well as what we can do to make our books better.

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Introduction

Other magazines cover technology, but *Maximum PC really* covers technology. What's the difference? We cover it not from the corporate spendthrift perspective, but from a place of passion and pure enthusiasm. In short, the other guys cover hardware. We love hardware. So much so that the *Maximum PC* Lab (which you'll read about in Chapter 2, "Maximum PC Standards & Practices") is a hub of constant activity. Products' reputations are routinely made or destroyed. Experiments are constantly underway, and the results are made public on a monthly basis in our magazine.

Let's face it: Buying computers or computer components is a tricky, complex process, fraught with doubt and misrepresentation. Over the course of the last year, we found ourselves answering one question related to this situation more often than any other: How—and why—do we test products in our Lab?

After answering it the first 150 times, we began to think to ourselves, "We should write a book that describes our testing philosophy and methodology, so that the public will be better educated—both about existing products and what to look for in the future." The end result is this book.

As I began to plan and write this book, I found that in order to describe our testing process and dispense tips regarding what you should look for when you're buying new gear, I found that the year's past events dovetailed nicely with our buying advice.

After reading the *Maximum PC 2005 Buyer's Guide*, you're probably going to find yourself thinking, "What a year!" Consider the following ground-breaking developments that occurred over the last 12 months:

- AMD rocked the tech world by releasing two new 64-bit CPUs—the Athlon 64 and Athlon 64 FX. For the first time ever, Intel found itself on the defensive—and chasing another company.
- In addition to completely changing its CPU naming conventions to de-emphasize clock speed, Intel also made a radical shift in CPU development strategy by abandoning several new P4 lines and embracing dual-core processors.
- ATI and nVidia released new videocards—nothing new there. But ATI's Radeon X800 XT and nVidia's GeForce 6800 each boasted an astonishing 150% improvement in game-related performance.
- Creative released a 7.1 speaker set, meaning that you can now play games and watch movies with a whopping total of eight speakers.
- Intel announced its upcoming HD Audio technology that, upon its release in the new Grantsdale mobo chipset, will allow full-fledged eight-channel sound *integrated onto the motherboard*.
- Alienware introduced a new high-end PC that uses two next-gen videocards (of the aforementioned 150% performance boost) to improve graphics performance by another 70%.
- Major PC manufacturers began to roll out Media Center PCs for usage in the living room. Based on a modified "Media Center" version of Windows XP, these systems provided TiVo-like capabilities and the ability to watch movies, share pictures, and surf the Internet.

This is just the tip of the iceberg. Over the course of the last 12 months, we also saw Intel introduce its Pentium 4 Prescott, the debut of BTX, and spontaneous evolution in almost every PC component category.

As I was researching, writing, and compiling this book, I found myself thinking the same thing. But upon further reflection, I came to realize that I could easily say the same thing about any of the past 10 years. Although personal computers have been in households for 20 years now, PC technology evolves at a rate so rapid it would have made Darwin dizzy.

Hence this book. My intent here is threefold.

First, I want to explore and discuss all of the year's major and minor developments in each PC component category. This will allow you to better understand the capabilities and performance of the current state of the art, and how much it's changed over the course of last year.

Second—and this is the most important function of the *Maximum PC 2005 Buyer's Guide*—this book contains valuable information that will help you make better purchasing decisions. To this end, each chapter of this book contains our most significant product reviews from the last year in each PC component category. Each chapter also details the *Maximum PC* Lab's testing procedures and our criteria for judging each product we review. Armed with this information, you'll be able to ask the right questions—and get the details most pertinent to your purchase.

Finally, this book is meant to celebrate some of the magazine's best and worst moments. I know that many of our faithful readers and subscribers will be reading this book, and I hope that you enjoy the walk down memory lane. I know I have.

Who Should Read This Book?

The short answer is that anyone passionate about PCs will enjoy the *Maximum PC 2005 Buyer's Guide*. The longer answer is that everyone from PC novices to crusty veterans will find value on every single page of this book. Whether you're looking to get a better understanding of how to make smarter purchasing decisions, to gain insight into how *Maximum PC* tests each product we review, or to simply revel in our magazine's 12-month history, you'll get something out of this.

I've written this book with the expectation that our magazine will publish a new Buyer's Guide every year, so this will also serve as an almanac of sorts.

For your convenience, I've broken this book into chapters that correspond with the major PC categories. Here's a quick rundown of how it works and what you can look forward to:

Maximum PC: The Year in Review: Chapter 1 walks you through the last year's worth of *Maximum PC* magazine. We'll take a look at the highs and lows in each issue, and divulge some of the behind-the-scenes triumphs and disasters even our most faithful readers never heard about.

Maximum PC Standards & Practices: Chapter 2 is an in-depth look at *Maximum PC*'s most hallowed ground—our testing Lab. Inside, you'll meet the editors, get a glimpse at our product reviewing practices, and learn about a few tests that went horribly wrong. By horribly wrong, I mean explosions, fires, and the occasional frog or two.

Motherboards & Core-Logic Chipsets: The rest of the world takes motherboards for granted, but before power users decide on a case or CPU, they choose their mobo. Chapter 3 is an extensive look at the most underrated PC component of its time. You'll read reviews of recently released mobos and learn about future developments.

Cases & Formfactor Standards: Besides looking good and serving as the PC embodiment of your personality, PC cases protect your PC's innards. There are literally hundreds available. We'll tell you which ones are good and which ones are crap.

Processors: Small and powerful, your CPU—also known as a "proc"—serves as the brain of your PC. The last year was an interesting and tumultuous period in this category, because chipmaking rivals AMD and Intel upped the competitive stakes with bold new designs and dazzling performance.

Hard Drives: Blazing speeds and astonishing capacities was the name of the game in this category last year. Can you say "400 gigabytes"? In this chapter, we'll show you how and why we test hard drives so rigorously, and explain what to look for when you're buying your next drive.

Videocards: Wow, what a year in the videocard space! In the middle of 2004, we saw the release of two ground-breaking cards. In Chapter 7, we put them through their paces—and come away duly impressed.

Soundcards: Back in the day, soundcards were like AM radio. Now, we're seeing the release of soundcards containing eight channels of audio surround sound. That's astonishing. Find out more in Chapter 8.

Optical Drives: Thanks to the new standards, burning your own music and movie CDs and DVDs has never been easier. And, shockingly, DVD capacities just doubled in size, thanks to dual-layer burners. Inside Chapter 9, you'll find details on how and why optical drives work, as well as insight into how we identify the fastest performers on the market.

Speakers: Like I mentioned, PC sound has climbed to new heights in terms of clarity and impact. While the speakers' category is one of the few to have slowed down in terms of evolution in design, prices

have plummeted. This means the time is right for you to upgrade your PC speaker systems. We'll show you how.

Pre-built PCs: If you're like us, you prefer building your own rig to buying a pre-made one. But there comes a time in every person's life where they have to go the pre-built route. PC design has become more intricate and varied than ever. In Chapter 11, we focus on super-powerful high-end laptops and desktops. We think you'll be surprised at what you see.

Displays: To LCD or not to LCD. That's the question in Chapter 12. In the middle of 2004, we rounded up eight LCDs in order to determine whether or not they're close to the quality levels of traditional, but more bulky CRT displays.

Mice & Keyboards: Until you've suffered a nasty repetitive stress injury, input devices tend to be an afterthought. They shouldn't be. While your standard mouse and keyboard is way better than it was 10 years ago, it's important to find the ergonomic input rig that's right for you. We'll show you how.

Wi-Fi: 2003 and 2004 were big years for wireless technology. Millions of consumers took a gigantic leap into home networking, and untethered themselves from wires. If you haven't done the same, you owe it to yourself. Read Chapter 14 to get started. And if you've already surfed the Wi-Fi waters, our hard-hitting reviews will show which routers and gear to buy.

Digital Devices: The objects of lust and infatuation, digital devices such as MP3 players and PDAs have captured consumers' attention over the last few years. How does *Maximum PC* review these gadgets? Chapter 15 reveals all.

Ask the Doctor: For years, *Maximum PC*'s resident tech expert has answered readers' toughest and most pressing questions. Here's the best of this year's answers.

The Watchdog: *Maximum PC*'s consumer advocate is no joke. The Dog tackles misleading PC vendors across the world. In Chapter 17, you can read the Dog's best columns from the last year. His bite is definitely as powerful as his bark; that's for sure.

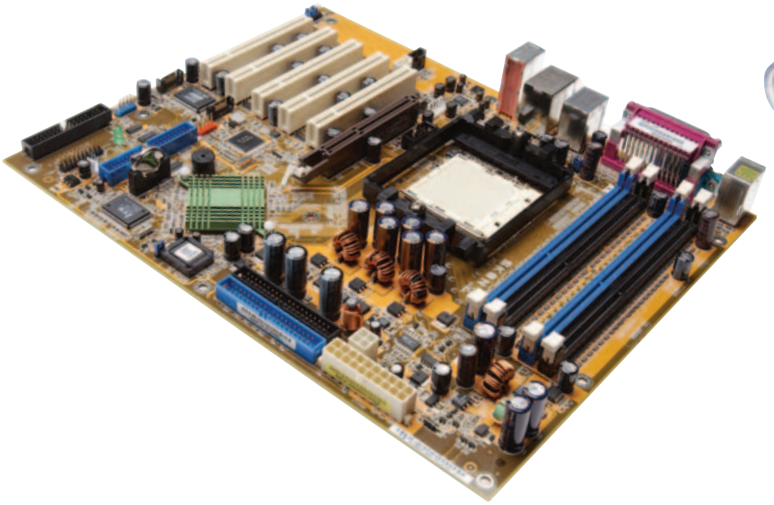
As you read the next 270+ pages, please keep this in mind: If you take your PC components and purchases for granted, you'll only be operating at 60% of your maximum capacity. This book will help you avoid that problem.

On behalf of myself and the entire *Maximum PC 2005 Buyer's Guide* staff, it is our sincere hope you enjoy the *2005 Maximum PC 2005 Buyer's Guide*!

Chapter One

Maximum PC: The Year in Review

It was the best of times, it was the best of times…



The setting couldn't have been more ideal: A gorgeous late September evening in San Francisco, a beautiful view of the city as seen from Alcatraz Island, and the promise of receiving a free copy of Half-Life 2, the most anticipated PC game of the previous 12 months (if not all of human history). What could be better? Editors, writers, and scammers seeking to sneak their way into the event of the year marked September 30, 2003 on their calendars.

In the minds of gamers, journalists, and the marketing flacks who worked for videocard manufacturer ATI, the evening was supposed to be a big night. Planned many months earlier, ATI had rented out the entire island—the original Rock!—in its entirety for the grand unveiling. Members of the press and a select few civilian gamers would be dazzled by ATI's graphics cards and receive a copy of *Half-Life 2*. All in exchange for their attendance.

Or not. The biggest event of the year quickly became the most disappointing. Just weeks before the event, Valve Software announced that *Half-Life 2* would slip to the end of 2003. And thus the question-asking began: What *would* Valve show at the event? What exactly did ATI have in store for us? Was attendance even necessary? Why even go?

Well, as it turned out, the night offered all the rollicking good times that a good open bar can make possible, but as an opportunity to gather critical information, it was a complete and utter wash. No new *Half-Life 2* information was released—no new gaming details, no new screenshots. All the new stories, feature stories, and even *cover* stories planned by the journalists in attendance instantaneously turned to dust in the wink of an eye.

Maximum PC felt the impact of Valve's release date delay. Our August cover story, written and executed in June, proclaimed that *Half-Life 2* was the "Game of the Year." We were banking on the fact that our August issue—arriving on newsstands one month before the release of the game—would be a boon for single-copy sales, the all-important barometer of a magazine's financial health. Thankfully, our issue *did* sell well, partially because we weren't promising an exclusive look at the game, but rather a *Maximum PC*–style investigation of the technology behind the game.

More than anything else, the events of September 30 underscored the challenges of publishing a monthly magazine on two-plus months of lead time. In our high-tech world, the currents shift as rapidly as they do in the frigid waters surrounding Alcatraz, and sometimes we get pushed under. It ain't easy.

But it sure is fun. As the *Maximum PC* staff walked down memory lane while assembling this chapter, we found ourselves laughing, crying, and marveling at the blood, sweat, and tears we experienced while publishing what we think is one of the world's finest PC hardware magazines. It kind of felt like one of those year-end finales of *Family Ties* or *Cheers*—the ones in which the cast fondly reminisces over all the hi-jinks and poignant moments of the past season. Yeah, like that. CD producer Josh Norem's test speakers blowing up… Saying goodbye to editor-in-chief Jon Phillips… Saying hello to new editor-in-chief George Jones. We were getting misty-eyed just thinking about it.

The other notion that came to mind as we paged through our past issues was how very, very different we are from other PC-related magazines. Our competition plays it safe and keeps it sterile, avoiding jokes and—heaven forbid!—even enthusiasm. Zzzzzzz. In our minds, our approach—which entails blunt honesty, persistent curiosity, massive heaps of enthusiasm, and a dash of reckless experimentation—is much more entertaining. And, ultimately, much more useful to real PC enthusiasts who share our passion for computing.

Regular *Maximum PC* readers already know what to expect from the 12-issue retrospective in this chapter. But for readers who have only experienced *Maximum PC* in small doses, or have never read our magazine before, we have one bit of advice: If you find yourself chuckling quietly, or even reacting in outrage, it's okay. Passion is our point.

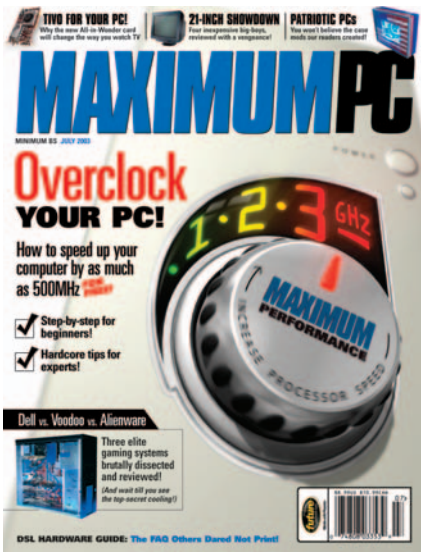
Why Our Year Begins in July

July to June does not a traditional calendar make. But from our perspective—and for the purposes of this chapter—we feel it's only natural to start our retrospective at 2003's mid-point. For some strange reason, the computing currents always cycle right around the middle of the year. This is the time when new products, announced in January at the Consumer Electronics Show, begin to be released in anticipation of the coming holiday season.

Interestingly, a magazine editor's life begins to get quite hectic in July. Magazine lead times being what they are—roughly two to three months out for *Maximum PC*—we find ourselves working on the September and October issues at the end of the summer. This means that we begin testing, reviewing, and writing about the holiday gear sometimes as early as July.

"BLUNT HONESTY, PERSISTENT CURIOSITY, MASSIVE HEAPS OF ENTHUSIASM, AND A DASH OF RECKLESS EXPERIMENTATION ARE MUCH MORE ENTERTAINING."

July 2003


TIVO FOR YOUR PC!
21-INCH SHOWDOWN
PATRIOTIC PCs
MAXIMUM PC
Overclock
YOUR PC!
How to speed up your computer by as much as 500MHz
Step-by-step for beginners!
Hardcore tips for experts!
1·2·3 GHz
MAXIMUM PERFORMANCE
INCREASE PROCESSOR SPEED
Dell vs. Voodoo vs. Alienware
Three elite gaming systems brutally dissected and reviewed!
DSL HARDWARE GUIDE: The FAQ Others Dared Not Print!

Issue highlights

Maximum PC reports that the Walt Disney Co. will be the first company to use DVDs that self-destruct two days after being opened.

The Fizzer virus fizzles out upon hitting the PC world; *Maximum PC* is on the scene with an in-depth explanation of why it didn't wreak the destruction everyone thought it would.

Grand Theft Auto: Vice City makes its PC debut and is soundly dismissed by editor Will Smith. "An excellent setting does not a good game make," he opines.

Hardcore techies know about the dark art, but few other PC users do. Hence the July 2003 cover story: "The Overclocker's Handbook." This story taught both experienced and not-so-experienced users how to gain up to a 500MHz increase in CPU clock speed by *overclocking*—that is, setting a processor at a speed that exceeds its factory rating.

Each CPU, we explained, is unique, and on the microscopic circuit level, some are more accepting of higher frequencies than others. For this reason, each CPU is individually tested for its speed potential the moment it steps off the production line. Procs that run for days on end at, say, 2.2GHz are labeled accordingly and tossed into the 2.2GHz bin. Procs that poop out at 2.2GHz are tossed in the 2GHz bin. However, some procs, we noted, can comfortably run at *2.4GHz*, but are placed in the 2.2GHz bin simply in order to meet customer demand. And *these* are the procs that are most ripe for the dark arts.

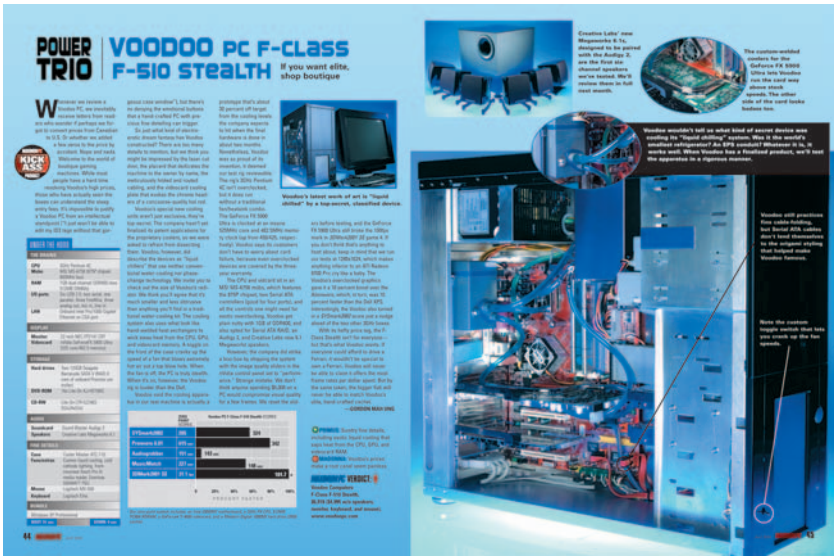
Overclocking is a risky practice—if you lack the cooling capabilities, you could fry your CPU and your maybe even your motherboard, rendering your PC inoperable. But *Maximum PC* boldly went where the competition feared to tread. We told users exactly how to overclock their computers. (For the full text of our July 2003 cover story, visit www.maximumpc.com.)

Firewall Fight!

"Software lawyers are a lot like lawyers," we opined in our July Head2Head department. "They're annoying and tedious, but when you need help with a threat, they're almost indispensable." So began our three-way shootout between Norton's *Personal Firewall 2003*, *Zone Alarm Pro*, and *BlackIce*, all tussling to be our pick for top software firewall. Unfortunately, none of the applications completely impressed us. We wanted more sophisticated features, such as automatic log analysis and safeguard settings, as well as greater ability to scale the level of lockdown to the severity of threat. Ultimately, we recommended Zone Labs' *Zone Alarm Pro* as our favorite. But the race was close.

Trio of PC Power

In another exciting three-way face-off, we tossed three OEM gaming machines against each other in the *Maximum PC* octagon, in order to see which one emerged the least bloody. The gaming gladiators included the XPS from Dell (the famed mass market manufacturer), the Area-51 from Alienware (once an upstart, now an emerging major player), and the F-Class F-510 Stealth from Voodoo (still regarded as a boutique PC maker). The resulting shootout generated sparks the likes of which *Maximum PC* readers hadn't seen since…the overclocking cover story from the month before!


POWER TRIO

VOODOO PC F-CLASS F-510 STEALTH

If you want elite, shop boutique

Each system came to the ring with promises of industry-standard 3D frame rates, high quality audio rivaling that of home theater systems, and mega-levels of gaudy attitude. And as a group, the trio of PCs was annoyingly consistent; each was armed with a 3GHz Pentium 4C, an 875P chipset, 1GB of RAM, Serial ATA RAID, and Audigy 2 soundcards. This made choosing first-, second-, and third-place winners near impossible. The decision was so close, in fact, we ultimately gave out individual awards for various aspects of each rig's design.

Homespun PCs

In a nod to the grassroots case-modding foundation from which *Maximum PC* was built on, the July issue featured a heartfelt look at patriotic case mods. Indeed, when PCs named "Rosie The Riveter," "Stars & Stripes Forever," and "The Binladenator" are the runners-up, you *know* you've got an interesting story.

One case mod that really wowed us was Jerami Campbell's "Vehement," a PC that was designed to induce "tears of joy for the glory of American freedom." Campell's system took the shape of a 3D American flag, and was designed to be mounted on a wall, much like a piece of art. Then there was Doug Donakowski's "Jug," a small formfactor Shuttle case that was transformed to resemble a P-47D Thunderbolt fighter jet. Rounding out our trio of winners was Kevin Schulthies' ultra-patriotic "Pride and Joy." Using a special technique he called *casewrapping*, Schulthies made his case look like it had a semi-transparent American flag wrapped around it. Ironically, Schulthies is a Canadian.

"THE FACT THAT PS2 PUNDITS TOUT GTA III AND VICE CITY AS THE GREATEST GAMES OF ALL TIME REINFORCED OUR BELIEF THAT THERE WEREN'T ANY GOOD PS2 GAMES."

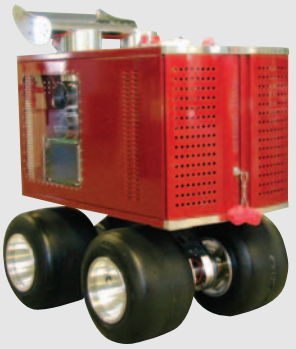
—WILL SMITH, TECHNICAL EDITOR

Big Reviews

In our July 2003 "Reviews" section, our lead story was a review of two new "next-generation" videocards: nVidia's GeForce FX 5900 Ultra 256MB and the ATI All-in-Wonder 9800 Pro—a TV tuner *cum* videocard. Tech Editor Will Smith expressed disappointment that nVidia's NV35-based 3D card still hogged up two mobo slots, but was impressed at the decreased noise generated by the fans and the increased cooling.

"Heavy Metal" July Rig of the Month:

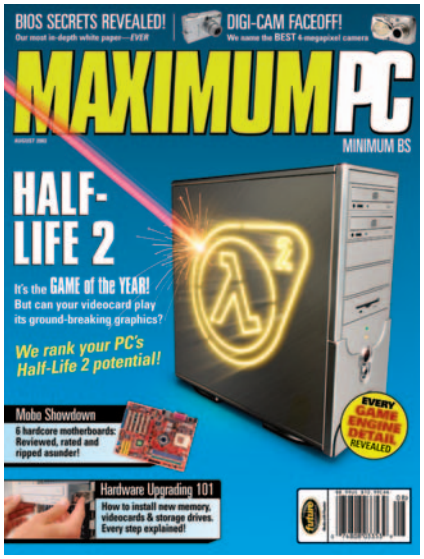
"Heavy Metal" first came to our attention as a Patriotic PC Case Mod Contest entry. Sadly, the tricked-out rig didn't win the contest, but it won many a heart at *Maximum PC*, leaving us no choice but to honor it as a Rig of the Month.



Will was similarly impressed with the All-in-Wonder, dubbed the AiW. Possessing a fast 3D core, an impressive suite of TV-tuning features, a remote control, and TiVo-like digital video recording options, this wondercard made us drool like babies. We're still using it, in fact.

Both videocards received a 9 ranking and our highly coveted Kick Ass Award.

August 2003


BIOS SECRETS REVEALED!
DIGI-CAM FACEOFF!
MAXIMUM PC
MINIMUM BS
HALF-LIFE 2
It's the GAME of the YEAR!
But can your videocard play its ground-breaking graphics?
We rank your PC's Half-Life 2 potential!
Mobo Showdown
6 hardcore motherboards: Reviewed, rated and ripped asunder!
EVERY GAME ENGINE DETAIL REVEALED
Hardware Upgrading 101
How to install new memory, videocards & storage drives. Every step explained!

Issue Highlights

Palm's Tungsten C PDA blows us away with more RAM than any other Palm on the market—at that time.

Maximum PC reports that simulated mob violence has beset *The Sims Online*. A group called the Sims Shadow Government takes over to allegedly address the anarchic behavior in the game.

A 4-megapixel digicam, Canon's Powershot S400 Digital Elph, receives a perfect 10 when pitted against the Olympus Stylus 400.

"*Half-Life 2* is the game of the year!" we trumpeted on the cover of the August 2003 issue. Doh! About halfway through July, Valve, the game's designer, announced that the game of the year wouldn't actually ship until 2004, the next year.

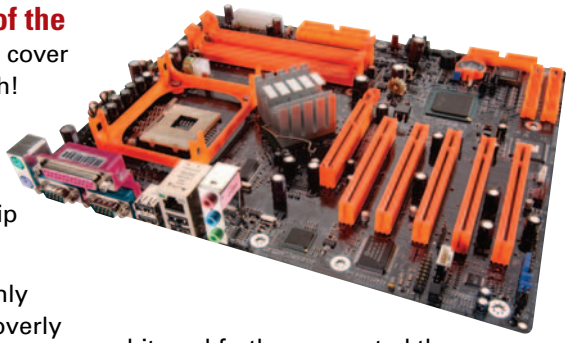
At least we weren't the only ones who got caught up in overly optimistic thinking. Graphics card maker ATI (peddler of the awe-inspiring Radeon 9800 series) believed so strongly that *Half-Life 2* would ship in mid-July, the company made plans to rent out the entire island of Alcatraz for a large promotional event, and promised that each attendee would receive a copy of the game. Needless to say, The Rock was devoid of *Half-Life 2* adventuring that Autumn night.

Still, though, our *Half-Life 2* story provided a handy technology guide to the game's 3D engine. We also provided an extremely handy chart that allowed gamers to see what game-specific effects and visual-quality levels their existing videocard would be able to execute.

Enter the BIOS!

Immediately following our technically oriented look at the most anticipated title of the year, *Maximum PC* focused on a topic that's fundamental to each and every PC: the BIOS.

In addition to providing a short history of the BIOS—did you know that it's a holdover from the very first days of the IBM Personal Computer?—we took readers on an interesting journey through the various features and subsets of the BIOS. We also included tips on how to flash-update your BIOS, and even break into it. The story was a huge hit, and further cemented the magazine's reputation as an expert source of high-level (or should that be low-level?) information.



Windows: The Next Generation

Our lead news-trend story—a peek at Windows Longhorn, Microsoft's highly anticipated follow-up to Windows XP—provoked considerable reader interest. In our investigative story, we indicated that the next interface for Windows would shuck the two-dimensional plane it had been based on for the previous 18 years in favor of a *three-dimensional* approach.

In this new interface, we reported, each window might be an independently rendered surface that could be smoothly scaled and manipulated at will. "Microsoft has already demonstrated display hacks such as windows that flutter in a pixellated breeze," we reported.

Security and an advanced data structure known as Windows Future Storage—WinFS for short—would also play integral roles in the completely new OS. (Shortly after our story broke, Microsoft announced that Windows Longhorn would likely not be available until late 2005, or possibly even 2006.)

In Other News . . .

Two other upcoming new technologies were mentioned in our forward-looking Quick Start section. The wireless 802.11g spec was finally finalized, meaning that Wi-Fi networking fans would soon be able to upgrade from the slower 802.11b standard, and thereby boost their networking speeds to around 20Mbps.

Even cooler was news of the Cornice Storage Element, a 1-inch, 1.5GB hard drive. This drive, we reported, was based on a completely new design that would use only one-third the components of a normal drive, meaning that it would cost much less. The Storage Element would be perfectly suited for affordable mobile devices ranging from tiny MP3 players to digital camcorders the size of a pack of cigarettes.

3D Card Benchmarking Improprieties?

Edited by Senior Editor Gordon Mah Ung, our "In the Lab" section is the place where our Lab experts delve into hardware minutia in explicit detail. In the August issue, we tackled a controversy that started percolating moments after we sent the July 2003 issue to press.

The story, first posted on ExtremeTech.com, indicated that videocard manufacturer nVidia was using a cheat for the *3DMark 2003* benchmark. The product in question was the company's GeForce FX 5900 Ultra videocard. ExtremeTech determined that when teamed with nVidia's 44.03 Detonator drivers, the 5900 Ultra was drawing only the visible portions of *3DMark 2003*'s Game 4 programmable shader test, and not the entire scene. This trick would boost nVidia's benchmark scores relative to those of ATI's.

August Rig of the Month: Biohazard

According to Paul Capello, Biohazard's creator: "An oversight in management left this unit unattended and in storage with a live culture inside. The unit has experienced a severe breach and the results are obvious." We'll say!

> ***WE DIDN'T THINK NVIDIA'S 44.03 DRIVER UPDATES WERE GOOD FOR 3D CARD BUYERS BECAUSE THE RESULTS OF THESE TWEAKS WERE ONLY VISIBLE IN THE BETA VERSION OF 3DMARK 2003.***
> ***—GORDON MAH UNG, SENIOR EDITOR***

Adding fuel to the fire, Futuremark, which developed *3DMark 2003*, jumped into the fray by accusing nVidia of cheating. The accusation claimed that the company was replacing *3DMark 2003*'s hardware requests with alternative instructions that were less GPU-intensive, thereby inflating their scores by doing less work than other 3D cards. Yikes!

Futuremark wound up patching the benchmark to prevent what nVidia called "optimizations." Shortly after the release of the 3.30 patch, the company mysteriously retracted its cheating claim, stating that "nVidia's driver design is an application-specific optimization and not a cheat."

September 2003

Issue Highlights

The Recording Industry Association of America went after illegal file sharers.

Apple's 30GB iPod MP3 player received a perfect 10 and Kick Ass Award.

Hulk PC game was released; sleep-inducing effects mirrored that of the movie.

The cover of our September issue was dominated by our yearly Dream Machine project, where we built the ultimate, spare-no-expense PC. It's such a big deal, you can read all about 2003's Dream Machine on the next two pages. Aside from that, though, this issue packed one heck of a wallop.

Complementing the Dream Machine, we assembled a Lean Machine. "We'd buy that for a thousand dollars!" we loudly exclaimed. And we did. Using only $1,000, we built a pretty sweet system that sported an Athlon XP 2500+ CPU, 512MB of RAM, an ATI Radeon 9600 Pro 3D videocard, and even featured a TV tuner card.

What was even more impressive wa that our little PC-that-could threw up some decent performance numbers. This rig could run next-gen, DirectX 9 games with all the features on. It could also burn CDs and DVDs, and even allowed us to watch and record our favorite TV programs. It cost $10,000 less than our vaunted Dream Machine, but frugal PC builders, take note: You can build a fast system for low cost!

Silence of the . . . Fans

Show the two-page picture beginning on page 42 of the September issue to any *Maximum PC* editor, and you'll hear at least 90 seconds of non-stop chuckling. The image featured two editors wearing honking big headphones and screaming bloody murder as they taped pillows to the sides of a PC.

Over the top? Sure. But who hasn't found themselves astonished at the noise levels PC fans generate these days? We said, "Enough!" and set about reducing the volume level to near-zero levels through the use of water cooling, quieter components, and soundproofing materials. The end result: a significantly quieter PC. Hey, what did you expect?

How to Share Your Broadband Connection

In 2002, PC users flocked to broadband like flies to hippopotamus dung; everyone and their mothers decided to take the plunge and enjoy faster networking speeds and Internet access. Then a funny thing happened: People started buying second computers, and even third computers, and wanted to hook them all up together.

We staunchly supported this development. Of course, we'd had multiple computers networked together in our homes for years, so we knew exactly how to instruct readers in the always-interesting world of home networking. Technical Editor Will Smith, the proud owner of a multifaceted wired/wireless network, got down and dirty for the readers, explaining in meticulous, step-by-step detail how to build a wired or wireless network.

the silence of the fans
High-performance components demand high-performance fans—and high-performance fans can create one hell of a racket. Sick and tired of hackneyed soundproofing solutions? Here's everything you need to know about properly quieting your PC.
by omeed chandra

He even demonstrated how to wire a house by slipping Ethernet cables through heating ducts, a piece of advice that would generate no small amount of email responses. Over the next three issues, various readers waged a vehement debate in our "In/Out" reader letters' section on the relative safety merits of threading CAT-5 through heating ducts.

"THE 30GB IPOD REPRESENTS THE VERY BEST OF WHAT APPLE STRIVES FOR: THAT TECHNOLOGY SHOULD NOT ONLY BE EASY TO USE, BUT A PLEASURE AS WELL."
—LOGAN DECKER, FEATURES EDITOR

Legal Tussles, Begin!

September's "Quick Start" section brought to light the first few shots of two separate legal sagas. Both are still ongoing today.

The first, the Recording Industry Association of America's heightened threats against peer-to-peer file sharing networks indicated that the RIAA was delivering up to 75 subpoenas a day to ISPs such as Verizon Communications and Comcast Communications. The story went on to describe several file-sharing mechanisms that provided a semblance of anonymity (such as *BitTorrent* and *Freenet*) before issuing a warning: No file-sharing client could guarantee complete anonymity.

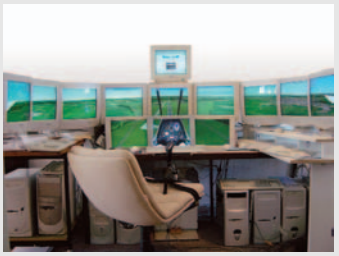
Just a few months later, the RIAA started filing lawsuits against the world's most egregious file sharers, including a 12-year-old kid and a 70-year-old grandmom.

The second legal shot across the public's file-sharing bow was fired by Chris Sontag of the SCO Group. Sontag alleged that, since 2001, commercial Linux customers had been purchasing and receiving software that included misappropriated UNIX software owned by the company. This declaration essentially stated that everyone using Linux was pirating SCO's version of UNIX.

The company offered Linux users a second chance, however, in the form of an offer to license their products through SCO. Consumers—including several major corporations—treated the declaration like a stepmom and ignored it completely. Later on in the year, SCO would become more aggressive and start targeting larger corporations such as IBM with lawsuits seeking major monetary damages. As of June 2004, no resolution had been reached.

September Rig of the Month: Wider View

Initially, Steve Ferris, the designer of this month's winner, only used 2 displays when flying the digital skies. But that only whet his appetite. Before long, he had 3 PCs, 4 monitors, and no girlfriend. Shortly thereafter, it became 5 PCs and 9 monitors! The final tally stood at a whopping 9 PCs and 13 monitors.



October 2003

Case Mod Kookery
Make Your Own Game Server
Mightiest Notebook Ever!
MAXIMUM PC
ULTIMATE PC TOOLKIT
Revealed: The 12 Best Fix-It, Security & Upkeep Utilities!
Our TOP PICKS
FIX WINDOWS!
KILL SPYWARE!
BACK UP YOUR SYSTEM!
AND MORE!
PC Repair Kit 2003
Must-have tools for serious hardware troubleshooting
Hard Drive Handbook
We explain the whys and hows of your most delicately engineered component!

Issue Highlights

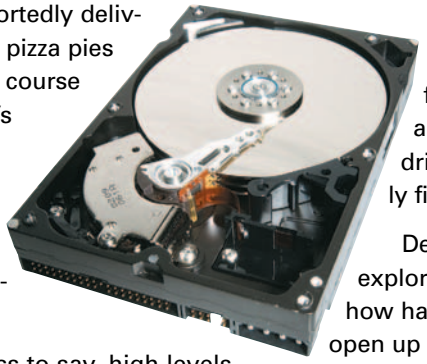
In an effort to combat movie piracy, the Motion Picture Association of America announced plans to launch a series of anti-piracy ads.

M-Systems announced a 1GB USB 2.0 DiskOnKey. "Not only are we able to load an entire DivX movie on the key," we gushed, "we can watch it from the device as well!"

Star Wars Galaxies, the long-awaited massively multiplayer RPG set in the *Star Wars* universe, got released. Lackluster reviews and deep-seated frustration ensued. Thankfully, as the months passed, LucasArts patched the game into acceptability.

What in the world was a Mac doing in *Maximum PC*? On page 13 of the esteemed pages of our magazine lay a story on Apple's newest baby—the G5. 64-bit data paths, a 1GHz frontside bus, and a sleek new look made us all want Macs. Not.

To help us calm down a little in the October issue, we sent Technical Editor Will Smith to Texas to participate in the judging of the Cyberathlete Professional League's biannual case modding contest. "It was an orgy of artificial intelligence, artificial killing, and artificial food," Smith reported, adding that Papa Johns reportedly delivered 1,000 pizza pies during the course of the CPL's greatest event, a $200,000 *Counter-Strike* tournament.



Needless to say, high levels of motivation, creativity, and sick design skills were on display. Consider the "Scarab." Designed by Gareth Powell, a.k.a. Lord Pheaton, the goal was to create a case with an organic, fluid shape. To accomplish this, he sculpted a plastic mold, then used the mold to make a fiberglass and Kevlar shell. And that was only good enough for *second* place.

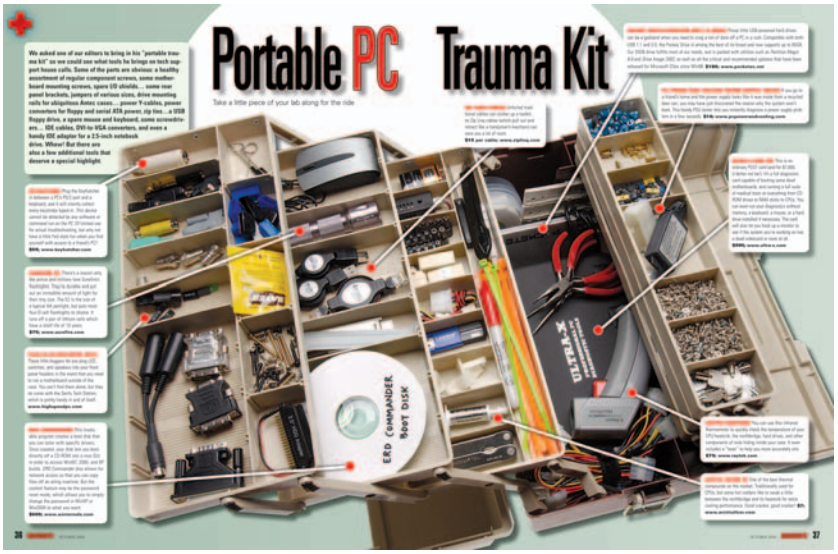
The first place case design, Lee Rakestraw's "You Can Take It with You," made us feel kind of funny because it was a fully functional PC mounted in a child-size coffin. That's right; we said child-sized coffin.

The Secret Lives of Hard Drives

Hard drives are amazing creatures. Don't laugh—they're sensitive to insults, too! Features Editor Logan Decker decided to investigate the inner workings of these common components and was shocked at what he found. For example…if you enlarged a drive head slider assembly (typically about 0.049 inches long) to a size roughly equal to the Sears Tower, and then enlarged the rest of the hard drive to this scale, the drive's read and write heads would be floating just five millimeters above the surface of the drive platters. That's a seriously fine-tuned mechanism!

Decker's hard drive handbook explored, in considerable detail, how hard drives work. When you open up a *Word* document, he explained, your hard drive looks up the address (or addresses) of your file in its table of contents. But these pieces might be scattered across different places on several platters, which makes the file retrieval process more challenging. How did hard drive inventors make a motion actuator that can accurately position and reposition drive heads hundreds of times a second above tracks that are microscopic in size? Magnets, good reader. Magnets.

Our story also explored various RAID configurations and Serial ATA, the newly developing technology that is rapidly obsolescing parallel ATA with faster transfer rates. (More on SATA later.)



In Other News . . . Your PC Is Sick!

What PC owner isn't familiar with the sinking, depressing feeling that accompanies the surety that your computer is sick? Or worse—dying. Hence Maximum PC's "Ultimate PC Toolkit." Inside this veritable fountain of knowledge, we divided PC problems into 12 categories. For each, we recommended the single best fix-it application. The list went something like this:

- **Hard drive defragging**: Diskeeper 7.0 Home Edition
- **Antivirus**: Norton AntiVirus 2003
- **Firewall protection**: ZoneAlarm Pro
- **Spam abatement**: Spam Pal
- **Anti-spyware**: Spybot Search & Destroy
- **Hard drive imaging**: Norton Ghost 2003
- **Hard drive management**: Partition Magic 8
- **Windows recovery**: ERD Commander
- **Deathmatch video capturing**: Camtasia
- **Remote access**: PCAnywhere 11.0
- **File recovery**: Undelete Home
- **Uninstalling**: CleanSweep

The story also included a classic *Maximum PC* signature touch: We showed readers how to build their own portable PC trauma kit (a fishing tackle box that included tools, backup CDs, software, plug-in accessories, and more). Any reader who took our advice and constructed such a kit has surely been more prepared for PC disaster than anyone on the planet.

Skip the Hologram—I'll Have the Hologram Touchscreen!

Readers got a small slice of the future on page 14. There we printed an interesting story on HoloTouch, a touchscreen interface that used a holographic display instead of a traditional screen.

The company's sci-fi sounding next-generation approach to displays entailed projecting a holographic image into the air. An infrared sensor would monitor the projection and detect the intrusion of your finger (or other body part) into the image. Then, just like any other input device, it would transmit the appropriate selection to software.

So where's HoloTouch now? Good question—the company's web site (www.holotouch.com) hasn't been updated since July 2003. Maybe the world just wasn't ready for the holographic touchscreen.

MY DISGUISE WAS STANDARD-ISSUE 'HARDCORE GAMER'—AN ORIGINAL DOOM II T-SHIRT AND CARGO SHORTS, COMPLETE WITH A BIG GRAB OF CHEETOS IN HAND—BUT NO ONE WAS BUYING IT. THE FIRST PACK OF GAMERS I INFILTRATED IMMEDIATELY MADE MY DISGUISE!
—WILL SMITH, TECHNICAL EDITOR

Reader Letter: Burning CAT-5

"I found the September issue article about sharing a broadband connection to be well-done, but I wish it had a warning that putting CAT-5 cable inside your heating vent is a very bad idea. Standard CAT-5 cable releases toxic fumes when ignited. The fumes travel quickly in heating vents and can cause severe respiratory distress. It's the kind of shortcut I would have taken if I hadn't been working toward my CCNA."

Scott Marshall's reader letter regarding the safety factor of running CAT-5 through a heater duct triggered an epic back-and-forth argument between our readers that lasted for four issues!

November 2003

Issue Highlights

The Recording Industry Association of America (RIAA) filed the first in a long series of lawsuits against egregious file sharers. A 12-year-old girl was named in the first wave of litigation.

Half-Life creator Gabe Newell set off a firestorm of controversy when he reported that *Half-Life 2* ran at a sluggardly 30 frames per second on nVidia's GeForce FX 5900 Ultra.

Intel announced the Pentium 4 Extreme Edition, a souped up P4 CPU that added a silly-large 2MB of Level 3 cache, giving the chip a total of 2.5MB of full-speed, on-die cache.

Given the choice, *Maximum PC*'s editors prefer to build our own PCs over buying pre-made ones any day. So when we started discussing our November cover story—Entertainment Center PCs—our mission immediately became clear. Recommend ones for readers to buy? Puh-lease. We decided to build our own.

And what a doozy of a home entertainment center PC we built! The end result of our efforts was a system that was part home theater, part TiVo, part game console, part stereo, and 100% breathtaking. We always have a good time constructing our feature stories, but this month took the cake. We used Shuttle's simple, quiet, and living room–friendly SN45G small form factor (SFF) case as our foundation, and built from there.

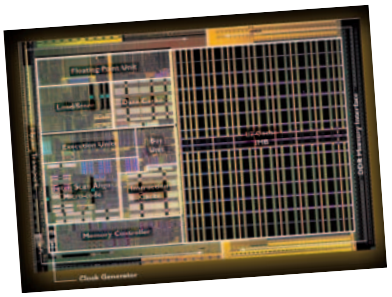
ATI's All-in-Wonder 9600 Pro, which tacks a TV and FM tuner to the company's Radeon 9600 3D videocard, allowed us to combine stellar gaming performance with television *and* software that bestows personal video recorder capabilities (think TiVo) upon your PC. Shocking, isn't it? We didn't' stop there; we also threw in Sony's WEGA KE-32TS2 32-inch plasma display and Klipsch's Ultra 5.1 speakers.

But what's really interesting is the ugly scene that occurred after the issue went to press. Four editors (who will not be named here) waged an all-out war involving taunts, thievery, and finally fisticuffs in order to gain control over the custom-built entertainment center for further "testing." It got so ugly that then editor-in-chief Jon Phillips ordered the PC dismantled and the components scattered to the four corners of the globe to prevent further distraction.

AMD's 64-Bit Gamble

Beleaguered and besieged, the chipmaker best known for imitating Intel's Pentium CPUs made the boldest statement of its life late in 2003 with the release of two new forward-thinking CPUs: the Athlon 64 FX-51 and the Athlon 64 3200+. The first CPUs intended for desktop usage capable of digesting both 32-bit and 64-bit code allowed AMD to actually out-trump Intel for once.

"Should AMD succeed," we speculated, "should home consumers and large corporations embrace its interpretation of 64-bit computing, Intel may be caught without a response. Conceivably, Intel could even be forced to adopt AMD's 64-bit approach!" In April 2004, this notion would be partially proved true, as Intel announced that its highly anticipated Pentium 4 Prescott CPU would indeed feature some latent 64-bit extensions.



But at the time, Senior Editor and author Gordon Mah Ung was more concerned with putting AMD's would-be Pentium 4 killers through their paces. What he found was that the Athlon 64 FX was a compelling product, the new processor of choice for current and future games. "All hail the Athlon 64 FX!" we proclaimed.

Build Your Own...
Entertainment Center PC
Imagine a single PC that can replace your home theater system, TiVo, game console, and stereo. Here's what to buy, and how to put it all together. BY WILL SMITH

single window rather than in separate windows. While the new browser wasn't as fast, as compatible, or as stable as *IE* (hey, it was only version 0.6), we found ourselves enamored.

Not every *Max PC* staffer agreed; several heated "conversations" arose out of Firebird's victory. To this day, a few editors' eyes still roll when the alternative web browser's name (it's now known as Firefox) gets mentioned. But consider this: Senior Editor Gordon Mah Ung just begrudgingly made the switch. When he uttered the words, "That's it, I need to switch to Firefox," the balance had shifted for good.

Internet Explorer Gets Defeated by a Brash Upstart

Located in the front of the magazine, our "Head2Head" section often creates controversial product match-ups, but few shootouts generated as much intrigue, heated debate, and reader email as the contest between Microsoft's *Internet Explorer (IE)* and Mozilla's *Firebird 0.6* web browser.

Reader Letter: The ATX Kabob Spec?

"I've been a subscriber for two years now and I love your mag. It's a high point of my month when *Maximum PC* arrives from New York in the diplomatic pouch. Anyway, a friend, briefly stationed in Iran last year, came across this case being used as a BBQ for kabobs. I thought you guys might get a kick out of it."

—Bob Cannon, Freetown, Sierra Leone

IE was such a mainstay by this point that many readers found themselves exhilarated to even hear about an alternate browser, particularly one that featured automatic pop-up blocking and tabbed browsing, which allows users to open different web pages in a

nVidia Gets Dissed by Makers of Half-Life 2

The controversy hit gamers and techies like a tidal wave. Valve Software, makers of *Half-Life 2*, one of the most anticipated 3D shooters of the year, declared at an ATI event that, in testing, nVidia's top line GeForce FX 5900 ran *Half-Life 2* in DirectX 9 mode at a crawling 30 frames per second. That was slower than ATI's *second*-best card, the Radeon 9600! Gabe Newell, Valve's managing director, also indicated that nVidia's other DirectX 9 cards, the 5200 and 5600, wouldn't even run the game at a playable speed.

Woo-boy. nVidia quickly issued a statement declaring that the Detonator drivers Valve used to test the 5900 Ultra during the event weren't indicative of current nVidia performance. The company proclaimed that with the newer drivers available, *Half-Life 2* would perform better. Of course, months later, id Software, makers of the equally anticipated *Doom 3*, indicated that their 3D shooter would run best on nVidia's 3D cards.

> ***AMD'S ATHLON 64 FX WAS A PENTIUM 4 KILLER BY ANY OTHER NAME, AND AMD BET THE PROVERBIAL FAB ON ITS SUCCESS.***
>
> ***—GORDON MAH UNG SENIOR EDITOR***

December 2003

INTEL vs. AMD vs. APPLE
We Host the FINAL Showdown
MAXIMUM PC
GEAR of the YEAR 2003
We Name the MUST-HAVE PC Components of 2003

Issue Highlights

Jon Philips penned his last "Release Notes" as the editor in chief of *Maximum PC*; at the same time he announced the imminent arrival of new EIC George Jones.

Josh Norem joined the *Maximum PC* staff as disc editor. This was the speaker and hard drive expert's second MPC tour of duty; prior to this stint, he served as an editor at a motorcycle magazine in Los Angeles.

Microsoft announced that Windows Longhorn, the next iteration of the company's Windows-based operating systems, wouldn't ship for another three years, meaning consumers won't see it until 2006 at the earliest.

The end-of-the-year issue is always a crazy time for the *Maximum PC* staff; it seems like 12 million PC products are released over the last few months of the year in an effort to cash in on holiday spending.

The upside is that we often find ourselves ensconced in gadgets, gear, and other loot. The downside is that it's hard to find the time and magazine space to write about it all. For this reason, every year we write up our top picks in an annual "Gear of the Year" story. "It's the crème de la crème," we declared. "The shiznit of our Lab's biznit." Indeed. Our top picks for 2003 included ATI's Radeon 9800XT, Apple's iPod, AMD's Athlon 64 FX-51, and Hewlett-Packard's iPaq 5555 PDA.

In a more light-hearted ceremony held shortly after our Gear of the Year awards at a separate location, the *Maximum PC* staff also played Santa and trumpeted what we deemed to be the finest gadget gifts of the year. Headlining the roster: SmartDisk's Flash Trax, a portable 80GB device that allowed digital photographers to capture the moment and show it to everyone seconds afterward. Other lab favorites included Shure's incredible-sounding E5c earphones and iRobot's Roomba, a robot-controlled vacuum cleaner.

CPU Showdown: Intel vs. AMD vs. Apple!

Perhaps the biggest story of the year, however, had nothing to do with the holidays. In the months before the holidays arrived, Intel, AMD, and Apple all released new CPUs, so we decided to pit the three processors—the Pentium 4 Extreme Edition, the Athlon 64 FX-51, and the Power PC 970—against each other in a winner-take-all cage match. We were most curious about how the PC procs would fare against Apple because we used a dual-Power PC CPU setup for the test.

To help choose the right cross-platform benchmarks, we ran a list of proposed tests past the folks at *MacAddict*, one of our sister magazines. For the most part, they blessed our selection of cross-platform tests, and also helped us create a special *Photoshop* test script. Additionally, they suggested we use the cross-platform app *Mathematica* because of its popularity with Mac users. At the end of our planning, we felt good about the playing field we had created.

The results were interesting. The 64 FX-51 won the CPU-oriented floating point intensive benchmarks, while Intel's cache-heavy P4EE swept the gaming tests. Surprisingly, the P4EE also won two design-oriented tests with *PhotoShop* and page design app *InDesign*. Apple held its own, however, winning 4 of the 12 total tests. "After looking at the official test results, and after considering the overall performance of all three platforms," we said, "we have to declare Intel's Pentium 4 Extreme Edition the winner by the thinnest of margins."

MacAddict Editor in Chief Rik Myslewski offered a dissenting opinion, expressing that he was pleased as punch that it "took two expensive just-released, specialized procs to edge out a standard, off-the-shelf dual-2GHz Power Mac G5."

Three's a Crowd
It's Intel vs. AMD vs. Apple in a bloody battle for CPU dominance! Three enter our benchmarking cage match, but only one seals victory!
PowerPC 970
IBM
intel pentium 4
AMD 64 Athlon FX
Intel*
AMD*
Apple*

Phillips assured readers that they'd be in good hands with new EIC George Jones, the former editor in chief of *Computer Gaming World* magazine and a die-hard PC junkie like the rest of the *Maximum PC* staff. It's not like Phillips was moving far away, however. After the transfer of power, he became Jones's boss and took over the reins of our parent company's newly formed tech department, which includes *Mobile PC*, *MacAddict*, and *EZ Tech Guides*.

"This Release Is Final"

On a sad note, *Maximum PC* bid a fond farewell to Editor in Chief Jon Phillips. A *Maximum PC* editor since issue #1 (back when the magazine was called *Boot*), Phillips used his final editorial to issue a final thank you to all the readers and people who engineered the fascinating products the magazine covered over the years.

> ***"APPLE'S BIGGEST PROBLEM ISN'T ITS HARDWARE, BUT RATHER ITS CURRENT SOFTWARE SUPPORT."***
>
> ***—GORDON MAH UNG, SENIOR EDITOR***

December Rig of the Month: Martini Glass

In preparation for his award-winning case mod, Sheldon Bright, creator of December's Rig of the Month, photographed a real-life martini and vectorized the artwork. He then cut sheets of thin aluminum and used an AccuBend machine to sculpt the metal into a martini glass shape. Neon lights added a nice Dean Martin kind of touch.

Case Mod of the Year!

Finally, we announced the winner of our long-running "Coolest PC Case Mod" contest, which was co-sponsored by CompUSA. The winner by a thin margin was Katie Hoch, a mechanical engineering student in Pennsylvania. Her winning entry was an astonishing work of functional—and relaxing—art: a water-cooled rig that doubled as an aquarium that contained living, breathing fish! In reward for her effort, Hoch won a $3,000 shopping spree at CompUSA. Hoch redeemed her award in January, and purchased a top-of-the-line laptop.

January 2004

WIRELESS SHOWDOWN
BEST SOFTWARE EVER
3D CARD SPEED TRIALS
MAXIMUM PC
HARDCORE HARDWARE
Our PC Experts preview the parts you must know about in 2004!
Includes Our Easy
20-Point Plan
For smart hardware upgrading
Windows Longhorn Update
New Information on Microsoft's Most Ambitious OS Yet

Issue Highlights

New Editor in Chief George Jones completed his first issue. By way of an introduction, the new guy explained that his first computer, the Commodore VIC-20, pulled him headfirst into the world of PC obsession.

In reviewing *Tiger Woods 2004*, previous EIC Jon Phillips became so enamored with his custom-made golfing alter ego, Joline Decarre, that several editors worried about his adjustment to life after *Maximum PC*.

Mozilla's *Firebird* browser won the top spot in our annual "Softy Awards," where we named the finest applications and utilities of the year.

The January issue of *Maximum PC* marked the debut of new Editor in Chief George Jones. He picked a fine issue to jump into the fray—January's cover story was a daunting one, featuring an in-depth look at one of the more controversial PCs to ever come through the *Maximum PC* offices.

On the surface, L Computer's Mach 3.8 seemed too good to be true. The system promised a 3.2GHz Pentium 4 CPU overclocked to 3.8GHz, four 15K Seagate Cheetah hard drives, a "PuRAM" drive made up of solid state flash RAM, and a case sporting a VGA-capable LCD display. Needless to say, we couldn't wait to get the PC in for testing. When we did, we were a little disappointed to find out that several of the components, like the PuRAM drive and the front-mounted LCD display, were missing. This made us wonder about L Computer's credibility. The end result of our investigation was a story that explored the implications of pushing the envelope and the controversy that could quickly surround a startup PC manufacturer making such outrageous claims.

Also inside the January issue: A massive nine-page "Hardcore Hardware" preview where the *Maximum PC* editors took a thoughtful, analytical look at the most significant new PC technologies we felt would debut in 2004.

Prognosticating is never an easy task, but it sure is fun. The more research we did, the more we began to realize that the process of reinventing the architecture of the PC's most fundamental building blocks would begin around June. The following technology shifts, we discovered, would bring higher performance and increased efficiency to our beloved PC. We got goose bumps just writing about them.

Serial ATA 2.0: We determined 2004 would be the year drive manufacturers would stop testing the SATA waters and dive into it, bringing increased drive access times to not just hardcore users, but the mainstream masses. We felt that the timing couldn't be better, because of the upgrade of the SATA spec to version 2.0. We marveled over the marked increase in transfer rate SATA 2 would bring—from 150MB/sec to 300MB/sec—but the really big news we reported was the addition of a new queuing algorithm called Native Command Queuing (NCQ). This allows the hard drive to respond to data requests in the order it deems most efficient, rather than the order received.

DDR2: Because we at *Maximum PC* believe that faster is better, DDR2's theoretical potential of twice the bandwidth of the already

Hardcore Hardware

Mach L

Too Good To Be True?

BY GORDON UNG AND GEORGE JONES

Flamboyant, cocky, and loaded with intrigue, L Computers' over-designed systems have commanded attention... and controversy. We convinced the PC maker to send us a Mach L system in order to get to the bottom of the mystery.

Reebok, Toyota, and Coca Cola ads aside, Miguel Liebermann, a former commercial director, is more like us than we ever would've imagined. In the late 1990s, while still a director, Liebermann had finally had it with his laptop's lackluster performance, so he took action the *Maximum PC* way: With the help of Taiwanese manufacturer Clevo, Liebermann custom-designed his own high-powered notebook. As luck would have it, his spec became an instant hit with the film-studio crowd. Thus began Liebermann's new career. Today he is the CEO of L Computers, a business committed to building and selling beyond-the-pale PCs.

Flashy, ostentatious, and flush with the promise of unbridled PC power and an over-the-top aesthetic, L's web site (www.go-l.com) instantly generated an avalanche of attention as soon as it went live. Almost as quickly, a small but vocal minority of skeptics set about questioning the veracity of the company's claims. In the end, all the hoopla made this upstart manufacturer's launch feel more like the release of a Britney Spears album than a desktop system.

In *Maximum PC*'s eight-year history, we've never received so many reader requests for us to review a single product. We had no choice but to request that L Computers send us the finest PC configuration it could muster. What arrived was a prototype preview version of its Mach L 3.8 PC, which inexplicably lacked several of the much-hyped technologies pimped on the web site (more on this later), but was nonetheless impressively specd.

very fast DDR400 RAM induced a bizarre Pavlovian drooling response. Talk about summer blockbusters! Scheduled for mid- to late-summer arrival, DDR2 would increase potential bandwidth by prefetching twice as much data as DDR does. The new memory also operates at a lower voltage of 1.8 volts versus 2.5-volt DDR memory. The only downside: To use DDR2, you'll have to buy a new motherboard. 'Tis a small price to pay, though, for such a dramatic increase in memory speed, right? Right?

> ***"L COMPUTER'S LAUNCH FELT MORE LIKE THE RELEASE OF A BRITNEY SPEARS ALBUM THAN A DESKTOP SYSTEM!"***
>
> ***—GORDON MAH UNG SENIOR EDITOR***

BTX: Quick quiz: What's the one PC part that's still kicking around after nearly 10 years? If you said the ATX PC case, you retain your geek dignity. One of the more interesting aspects of the "Hardcore Hardware" story was our prediction of the slow, gradual obsolescence of the ATX case. In it's place: BTX, a brand new spec for PC cases designed to meet the thermal requirements of tomorrow's hyper-hot CPUs, videocards, and other components. The immediate difference in BTX, we stated, is the reverse mounting of the motherboard; you'll have to open the right side of the PC case to get at your PC's innards in the future. Another big switch is CPU placement; ATX cases locate the CPU just under the power supply. In the BTX design, the processor resides in the middle-front of the case. This way a fan can suck cool air from outside the case and blow it directly over the CPU first, before it warms up.

But Wait, There Was More . . .

Nestled snugly into the January issue was our second annual Softy Awards, where we counted down the "10 most amazing, most indispensable applications and utilities" of the previous year.

After bickering sessions that would put the United States Senate to shame, our final list named Mozilla's *Firebird* browser (now named Firefox) the best app of the year. "*Firebird* is nothing short of a revelatory experience," we opined. For the *Maximum PC* editors, user-friendly efficiencies such as tabbed browsing, which allows you to open multiple web pages within the same window, felt like a gratifying departure from Internet Explorer's clunky, multi-window approach.

Placing second was Trillian Pro 2.0, a fantastic, simple-to-use instant messaging client.

Apple's iTunes music software placed third—we loved that this music service was a superb, easy-to-use digital jukebox that didn't skimp on features. As an example, it provided intelligent music file management and playback, easy access to Internet radio stations, and drag-and-drop integration with the iPod.

January Rig of the Month: The Radioactive Computer

Designed by Joshua Driggs (a.k.a. ZapWizard), January's Rig of the Month winner was designed to look like an L.E.D.-lit ammo box. The front panel was taken from old military radios, and the vacuum florescent display impressed us with its capability to display system stats, *WinAmp* visuals, Divx movies, or the sine wave pictured here.

February 2004

GRAPHICS TRANSPLANT
CAN YOUR PC LAND YOU IN JAIL?
GAMES OF THE YEAR!
MAXIMUM PC
POWER UP WinXP!
Quench your PC thirst with 13 pages of our most coveted and essential Windows energizing secrets!
SPEED UP PERFORMANCE
IMPROVE MICROSOFT OUTLOOK, WORD, AND WINDOWS MEDIA PLAYER
CUSTOMIZE YOUR INTERFACE
MAKE GAMES RUN FASTER
Western Digital's Raptor 740GB
Lab-tested: The fastest hard drive on the planet!
Microsoft plots the death of BIOS
XP EXTREME
Unleash Your OS Power!

Issue Highlights

Maximum PC donned white rubber gloves and performed the first laptop video graphics transplant in the magazine's history. The subject: Alienware's newly-released Area-51m, the first portable to allow a user-performed graphics processor unit (GPU) upgrade.

PlanetSide, *Star Wars: Knights of the Old Republic*, and *Deus Ex: Invisible War* received top honors in the magazine's first Game of the Year awards.

Sysmark 2004 maked its debut. Our Lab immediately began using it to benchmark the new PCs we were reviewing.

"Power up Windows XP!" we boldly exclaimed on the cover of our February issue. From the garbled sounds of ecstasy our readers emitted, this story struck a major chord with folks. Hey, if we're about anything at *Maximum PC*, we're about making our readers happy.

The article covered 13 pages of jaw-dropping tips, ranging from speeding up Windows to improving everyday applications such as Microsoft *Word* and *Outlook*, to customizing the way Windows looks and feels. As the *Maximum PC* editors meticulously constructed this story, we found ourselves experiencing a buzz-like sensation we imagined to be not unlike nirvana. This proves something we've preached for years: Tinkering, hacking, and upgrading your PC is in and of itself a spiritual practice.

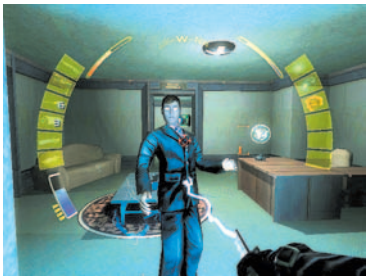
Apparently, entering *Maximum PC* contests was also a religious experience. At the end of our Windows XP tips story, we solicited readers for their finest Win XP tips, and promised the top two submissions a Creative Labs Audigy 2 ZS soundcard or an ATI Radeon 9800XT 3D videocard. We received an avalanche of tips and emails in response, enough to publish our own book of Windows tips.

But the *Maximum PC* fun didn't stop there. (It never does.) In "Know Your PC Rights 2004," we explored the fascinating grey areas surrounding PC usage rights. An example of such a question resided on page 46: "Is it a crime," we asked, "to log into a next-door neighbor's unsecured wireless network and surf the web using the connection?" The panel of legal experts we assembled to field this and the other nine fascinating questions in the story concluded that such action was similar to stealing cable, so yes, yes it was a crime. "It's a digital trespass, plain and simple," they stated.

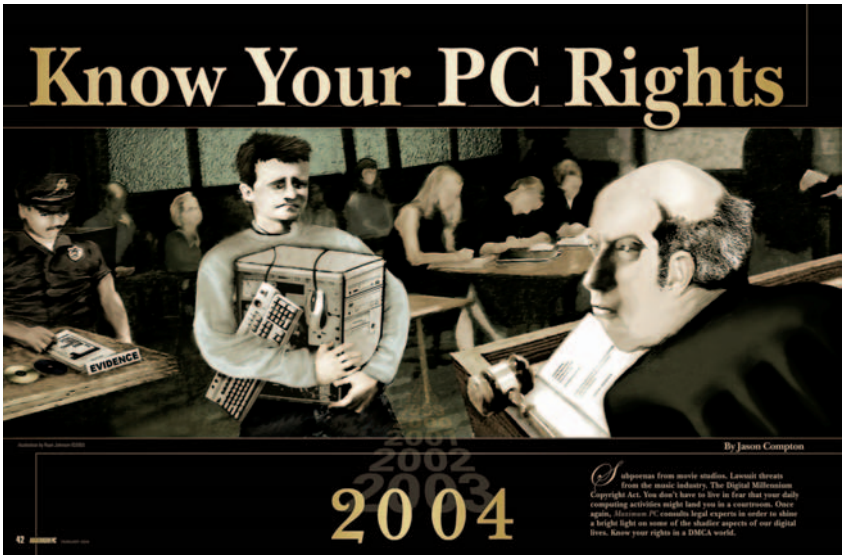
Readers familiar with *Maximum PC* remembered a similar story from 2003; they were correct. We had published a PC rights story the previous year that was so popular, we revisited the theme in the February issue. Again, we were inundated with requests and positive comments. Who knows? Maybe we'll do the story again in 2005.

The Watchdog Bites

Our anonymous consumer advocate, better known as the Watchdog, took a massive bite out of IBM in a brilliantly researched and reported special report. The story centered around the class action lawsuit surrounding IBM's notorious DeskStar 75GXP hard drive, also known as the "Death Star" because it was so crash prone. In classic Watchdog style, our nameless reporter scoured the confidential emails, depositions, and documents the moment they were unsealed in a California court.



What he found shocked everyone. IBM's salespeople knew about the drives' problems, to the point where they decided to start dumping the units into cheaper markets!



Our Single-Player Game of the Year was *Star Wars: Knights of the Old Republic*. An unbelievable experience that absolutely captivated our attention for hours upon hours at a time, Bioware's and LucasArts's easily approached *Star Wars* role-playing game was a transcendent gaming experience; the kind that had us up at 4:00 a.m. wondering where the night went.

The third award in our Gaming Softies was for Technical Excellence, and Eidos's *Deus Ex: Invisible War* took the honors there because of its use of "emergent" play elements that allow the player to determine his own path and his own style of play.

We expect to award prizes in even more categories for next year's Gaming Softies awards, so make sure you don't miss it!

Maximum PC Chooses Its Game of the Year

Prior to 2004, we incorporated our annual Game of the Year selections into our annual Softy Awards. This year, we changed our course, however, and decided to give games their own special awards ceremony. We donned tuxedo shirts and black jeans for the honors and created a special version of our version of Oscar—the cherished and gilded ReaderMan statue.

Determining the winners was no easy task, but we eventually came to a consensus. *Planetside*, a strategy-rich multiplayer action game, won the Game of the Year honor. Its combination of fast-paced play with excellent group dynamics won our hearts, but more importantly, the game's designers' ability to rapidly improve the game world and rules to craft a constantly evolving experience was laudable.

February Rig of the Month: Lego PC

The work of John Zalewski, the Lego PC required 24 hours of construction and 3,000 interlocking plastic parts. "Many adults got a kick out of the computer," he explained. "They were surprised it was possible for a computer to work in anything other than a big metal box." Zalewski stayed true to the Lego theme: He only used glue to mount a Lego onto the power button.

"IN EVERY HARD DRIVE TEST WE RAN, WESTERN DIGITAL'S 74GB RAPTOR BLEW US AWAY. AT THE TIME, IT WAS THE FASTEST DRIVE WE'D EVER SEEN!"

—JOSH NOREM, CD AND WEB SITE PRODUCER

March 2004

Stream Your MP3s!
Control Your PC from Anywhere
Hack Your iPod
MAXIMUM PC
THE PERFECT
Wireless
NETWORK
SET UP A WIRELESS HOME IN UNDER ONE HOUR!
Build the perfect network from scratch
Improve your wireless range and speed
Troubleshoot all your Wi-Fi problems
Includes top picks for routers, PC cards, and more!
intel
pentium 4
Intel's Hot New CPU!
It's fast. It's future-proof. It's different. So why isn't it called Pentium 5?
The Complete Story—only in Maximum PC

Issue Highlights

In a closely contested "Head2Head" battle of webmail services, Yahoo! Mail bested MSN's Hotmail. The cinching factor: Yahoo Mail offered more features.

Half the *Maximum PC* staff got felled by a devastating and highly contagious flu; undaunted, the survivors shouldered the workload and got the job done.

During his infamous frequency sweep tests, Editor Josh Norem literally destroyed an inexpensive set of 2.1 speakers. At the high stages of the frequency test, he heard a *pop*, then noticed wisps of smoke rising from the left speaker.

Dubbed the "Tide" cover, March represented *Maximum PC*'s second-ever Wi-Fi networking cover. "Set up a Wireless Network in under one hour!" we proclaimed. Judging by the number of responses we received from readers, thousands took our advice.

Interestingly, in planning the March issue, we asked our friends and family about their wireless networks and found ourselves stunned at the number of PC experts who still hadn't set up a wireless network in their home. We set about correcting this grotesque injustice.

To illustrate the tips, techniques, and troubleshooting tips in author Will Smith's article, the magazine purchased a 1:12 scale plastic postmodern dollhouse from the San Francisco Museum of Modern Art store. It was, in the words of art director Natalie Jeday, "too good to be true."

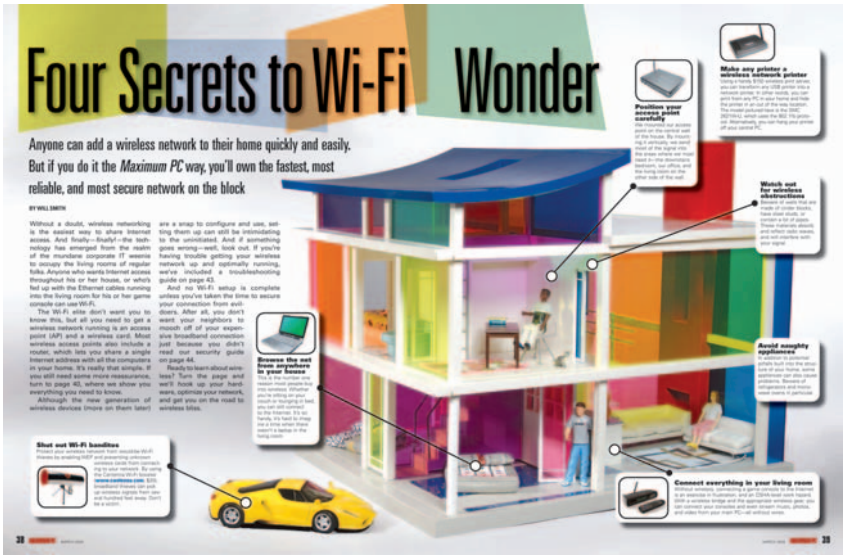
The dollhouse served as a muse of sorts for us. Some of the more interesting tips we waxed eloquently about included

- Mounting your wireless access point on its side on a wall can increase the wireless range throughout your house.
- When facing incompatibility problems, it's a good idea to update the firmware on your access point and wireless Ethernet adapters. (Much like you would update your video card's drivers if you were experiencing display difficulties.)
- If you're experiencing compatibility problems with your wireless network, updating your router's firmware may quickly remedy the incompatibility.
- Wireless cameras, which are easy to set up, are a great way to have fun watching your pets—or an efficient way to monitor the safety of your home.

Pentium 4 Prescott = Pentium 5?

While our wireless networking story was universally received with enthusiasm, Senior Editor Gordon Mah Ung's exposé on Intel's newly released CPU in its Pentium 4 line of processors, dubbed Prescott, generated considerable controversy.

Titled, "Why Isn't Prescott Pentium 5?" this feature story took a brutally honest look at the new CPU's architecture as well as its strengths and weaknesses. The proc's incredibly long and sophisticated 31-stage pipeline signaled that this chip could easily scale three to four years into the future while continuing to increase in speed and power. However, in terms of present usefulness, we had mixed feelings. "Would we recommend buying the Prescott today?" we asked back in the March issue. "No," came the answer, pure and simple.


Four Secrets to Wi-Fi Wonder
Anyone can add a wireless network to their home quickly and easily. But if you do it the Maximum PC way, you'll own the fastest, most reliable, and most secure network on the block

The story's two-page opening spread used the metaphor of a virtual librarian to illustrate, in three short steps, how RAM functions. First the "librarian" locates the correct information among the vast volumes of bits of information contained in RAM. Second, the librarian grabs the correct volume, and replaces it with another volume, while noting the location. Finally, the tireless librarian delivers the correct volume to the proper place.

But with this said, we also indicated that, because of the improved architecture, this would likely be the CPU we'd be using in all our desktops as early as the end of 2004.

Maximum PC readers' reactions ranged from, well, outrage at our perceived Prescott bashing to outrage at our perceived Prescott pandering. By the time March was over, Editor in Chief George Jones had received more strongly argued 1,500 word treatises on Prescott than any other story in his tenure.

RAM, RAM, Everywhere

Our third feature story of the month centered on memory in a *Maximum PC*–style RAM handbook. The goal of the story was to explain, in as granular a level of detail as we could, how and why RAM works, how PCs use it, and what the slew of different nomenclature means.

> ***THE MOMENT I GOT MY HANDS ON TOSHIBA'S E805 POCKETPC, WHICH WAS THE FIRST PDA TO DISPLAY 640X480, I KNEW I HAD A PROBLEM. EVERYONE KEPT GLARING AT ME WITH ENVY!***
>
> ***—LOGAN DECKER, FEATURES EDITOR***

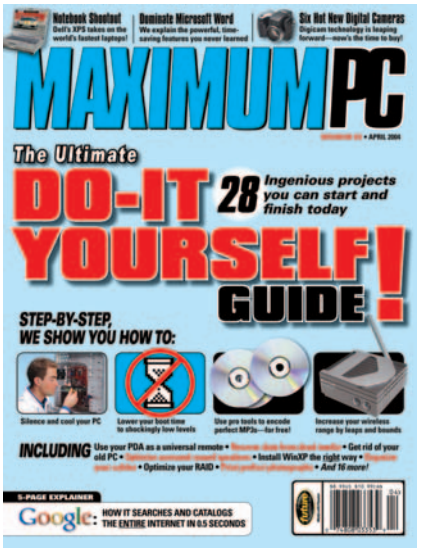
That's Not Funny!

One of the key aspects that sets *Maximum PC* apart from our boring competitors is our sense of humor, a shining example of which appears every month in our "In the Lab" section. Each issue, we create a "Photo Funny." These comedic sketches range from the inane to the wickedly ironic; March's photo funny was both.

In the first panel, Editor in Chief George Jones aggressively admonishes editors Logan Decker and Gordon Mah Ung for not being funny enough. Desperate to please the new boss, Decker and Ung hit a whiteboard, sketching equations and exploring the mathematical permutations of "funny." The punchline: a bewildered Ung wearing a beaglepuss and trying to type with a rubber chicken. Now that's funny!

EDITOR'S EDICT
Be More Funny!
New Editor in Chief George Jones lays down an edict when he reads the February issue: "You know what's funny about you guys? Not one damn thing. Be more funny by the end of the week or you're fired!"
In a desperate bid to save their jobs, Logan and Gordon hit the Lab. While testing the side effects of knock-knock jokes, they stumble upon the Decker-Ung Unifying Theory of Humor, which lets them mathematically determine the funniest things in the universe...
Damn that Logan. I never should've trusted his numbers. Something about this just doesn't feel right.

April 2004


Notebook Shootout
Dominate Microsoft Word
Six Hot New Digital Cameras
MAXIMUM PC
The Ultimate
DO-IT YOURSELF GUIDE!
28 Ingenious projects you can start and finish today
STEP-BY-STEP, WE SHOW YOU HOW TO:
INCLUDING
5-PAGE EXPLAINER
Google: HOW IT SEARCHES AND CATALOGS THE ENTIRE INTERNET IN 0.5 SECONDS

Issue Highlights

Philips released details on its first-ever flexible display, and indicated this unbelievable technology could be available as soon as 2005. *Maximum PC* broke the story on the front page of its "Quick Start" section.

On the next-to-last day of shipping the April issue to the printer, a car alarm went off right outside the window of the *Maximum PC* offices. It blared uninterrupted for six straight hours, tragically driving several staffers temporarily insane.

Counter-Strike: Condition Zero, the long-awaited single-player version of one of the most popular multiplayer games of all time, made its debut. *Maximum PC* soundly disses it with a 6 out of 10 rating. "Mediocre," we called it.

Ah, April. The month when the world got sprung from winter turned out to be an issue of unbridled optimism and project planning for *Maximum PC* readers. The first page of our "Quick Start" section foretold a rapidly approaching—as in 2005—future when flexible displays become available to the public, allowing consumers to literally roll up their LCD and place it in their pockets. Or read them like newspapers.

The optimism didn't end there. Our ambitious lead cover story—"The Ultimate Do It Yourself Guide," promised a slew of projects, upgrades, tweaks, and hacks dedicated PC enthusiasts could get into with some gusto.

And the ultimate D.I.Y. guide this was. Inside, we described 29 projects Max PC readers could perform on their computers. Examples of these how-to projects included

- Quieting—or even silencing!—your PC
- Installing fans and blow holes for cooling
- Using your Pocket PC as a universal remote control
- How to set up a process for burning a perfect-sounding CD with a single mouse-click

We even explained how to get rid of old PC equipment (call Dell—they'll do it for $15), and how to wipe your hard drive clean…you know, in case the feds were to come crashing down on your music-burning "operation" one day.

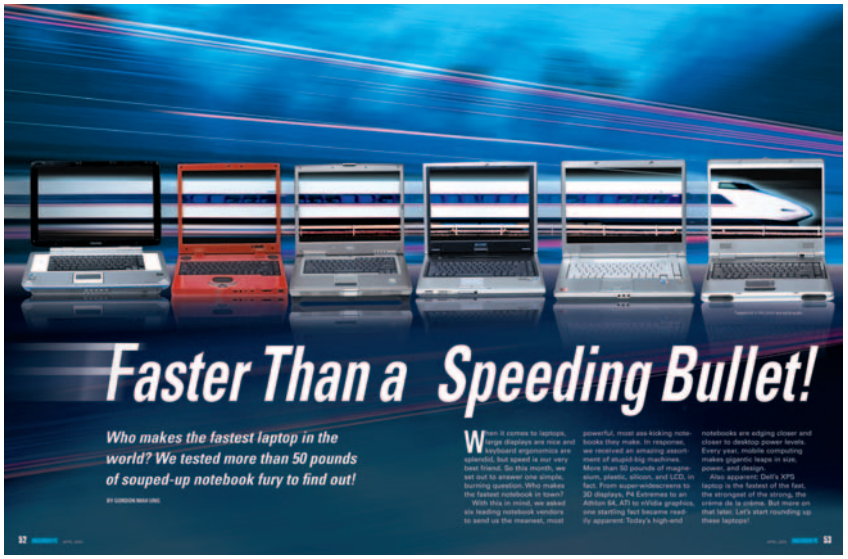
Google Boggles the Mind

Another interesting story in the April issue was our Google tech explainer. This story explained in explicit detail how the world's ultimate search engine manages to operate so efficiently, so accurately, and so quickly.

It turns out that one of the key reasons Google has been able to process your search results in the blink of an eye is that the search engine uses an army of intelligent GoogleBots to archive *every single* page of the Internet every two or three days! On top of this, readers learned that Google's server farms consist of inexpensive Linux-based PCs (purchased from Fryes, of all places) linked together through the company's proprietary programming. Finally, our story closed with an explanation of PageRank, which provides the most relevant results for users—and allows for some interesting—and utterly democratic—forms of hacking.

The Fastest Notebooks in the World!

Maximum PC's unofficial mantra is "Pure PC Power," and the April issue's laptop roundup epitomizes


Faster Than a Speeding Bullet!
Who makes the fastest laptop in the world? We tested more than 50 pounds of souped-up notebook fury to find out!

this mind frame. In this feature story *cum* shootout, Senior Editor Gordon Mah Ung procured six of the fastest laptops in the world with a single goal in mind: determining which one ran fastest. To illustrate this theme, the opening spread of the story featured a Japanese bullet train streaking across the screens of the six portable PC competitors.

The results weren't even close. Dell's XPS gaming notebook ran away from the competition, posting benchmarking results that were faster than the *desktop PC* we reviewed in the same issue. While finishing a distant second to Dell's laptop, Alienware's notebook PC, which is the first we had seen that allows users to upgrade their graphics chip on their own, merited some breathy praise of its own.

April Rig of the Month: The Matrimony Mod

Controversial, shocking, and genuinely touching, Michael Johnson's Rig of the Month was a computer transformed into a wedding proposal for his beloved. This mod of the month was adorned with a faux wedding cake that contained the engagement ring and the words "Will you do me the honor?" etched into the side of the case.

Intel Shines and Gets Shined

Interestingly, right as we were going to press, Intel used its Intel Developers' Forum to finally acknowledge what writers and analysts had been speculating about for months: that its x86 architecture would indeed contain 64-bit extensions. Initially planned for its upcoming Xeon CPU, code-named Nocona, the company indicated that the extensions would be compatible with AMD's 64-bit extensions. However, Intel also made it clear that these extensions would not be present in CPUs designated for desktop users.

> ***WHEN STANDING NEAR THE 12 SUBWOOFER FORTRESS I CONSTRUCTED IN THE LAB, MY PANT LEGS ACTUALLY FLAPPED LIKE FLAGS IN THE WIND DUE TO THE SHEER STRENGTH OF THE SOUND WAVES!***
>
> ***—JOSH NOREM, CD AND WEB SITE PRODUCER***

On the same page as this announcement however, *Maximum PC* writer Tom Halfhill boldly explained that Intel's Pentium 4 Prescott sucked in his "Fast Forward" column, appropriately titled "Why Prescott Sucks." In this well-written story, Halfhill, an analyst for *Microprocessor Report*, criticized Intel's new Pentium 4 CPU for consuming more power while running at the same clock speed as the fastest Northwood-based P4 (103W vs. 89W at 3.4GHz). He also found that Prescott leaks significantly more power than other CPUs in the same class, even when it isn't working hard.

The problem, he indicates, is that while Intel shifted to a smaller fabrication technology for Prescott (it uses a 90-nanometer process versus the Northwood's 130-nanometer), the new CPU's new pipeline and larger L2 cache (1MB vs 512KB for the Northwood) requires more transistors and therefore burns more power.

"Intel knows Prescott has problems," Halfhill closed his column with, "so count on future versions to offer a better power/performance ratio."

May 2004

Issue Highlights

Rumors leaked that Microsoft was working on a new, interim version of Windows XP, code-named Windows Reloaded.

AMD released its new FX-53 CPU. We pitted it against Intel's Pentium 4 Extreme Edition in a winner-take-all "Head2Head" battle. Unbelievably, the two procs came out dead even. We advised cost-conscious PC upgraders and builders to go with AMD's CPU.

Editor Josh Norem tackled the ultimate PC building challenge: the Lean Machine. He built $500, $1,000, and $1,500 systems. Unfortunately, in the process, he became unnaturally attached to the most expensive budget PC, naming it "Bezelbub."

May started with a bang, with a special *Maximum PC* report in our opening "Quick Start" section on Hitachi's gi-normous five-platter 400GB hard drive. Weren't 250GB drives considered huge just a year prior? Uh, no.

More Intel news followed, as we reported that the chipmaker was getting behind three new future-oriented technologies, including WiMax (also known as the 802.16 wireless protocol), which could theoretically enable wireless metropolitan area networks and Internet access via large urban towers similar to cellular towers.

"Fast Forward" columnist Tom Halfhill also followed up on the Intel 64-bit extension brouhaha with a meticulous analysis/comparison of Intel's 64-bit extension scheme and AMD's schematics. His conclusion: The two were virtually the same, which raised some interesting issues. What does it mean to the power dynamic between the two companies, Halfhill wondered, if Intel is now the chipmaker reverse-engineering its competitor's designs? Time would tell...

The Future of 3D

Occasionally, the lead times and hard deadlines of magazine publishing can make for a stressful month. Such was the case with our May issue's cover topic, 3D video cards and gaming.

The centerpiece of the story was an exclusive look at nVidia's brand new NV40 3D chipset and the upcoming GeForce 6800 videocard based on the new graphics processor unit (GPU). However, seven days before we started shipping the magazine to the printer, nVidia still wasn't sure their videocard was ready for public consumption.

It all worked out in the long run, and Technical Editor Will Smith got to take a firsthand look at the card. What he saw impressed the hell out of him...and us. These days, a videocard's performance hinges on its abilities to process, color, treat, and draw individual pixels on a screen. In games like *Doom 3*, this is no small task, which is why the GeForce 6800's faster clock speed and ability to perform two operations on each pixel was such a big deal to us.

"The GeForce 6800 should exhibit better performance than its predecessors and the competition," we opined in the story, "because nVidia has equipped the NV40 with an astonishing 16 pipelines. That's double the number of pipelines in ATI's Radeon 9800 and four times the number of pipelines in the GeForce FX 5950."

While ATI, nVidia's chief competitor, didn't have a videocard ready for us to look at for the May issue, the Toronto-based company did reveal a few choice details planned around its next-gen GPU, code-named R420. Interestingly, what we found didn't seem nearly as impressive as nVidia's NV40. A simple clock-speed increase, it seemed, was the name of ATI's game.

In closing the 3D videocard portion of the cover story, we declared our picks for the top 10 3D games of 2004. *Doom 3* and *Half-Life 2* were at the lead of the pack, which also included a few non-shooters, such as EA's *Lord of the Rings* and Activision's *Rome: Total War*.

WHY MICROSOFT ENGINEERS DECIDED TO CODE NAME AN INTERIM VERSION OF WINDOWS AS WINDOWS RELOADED IS BEYOND ME. DIDN'T THEY SEE THE SECOND INSTALLATION OF THE MATRIX TRILOGY?
—LOGAN DECKER, FEATURES EDITOR

But the gaming fun didn't stop there. As a part of our 3D gaming coverage, we conducted our second *Maximum PC* challenge of the year. In this one, we pitted eight different flat-panel LCD displays against each other with one question in mind: Could LCDs finally successfully compete with a larger, bulkier, but more responsive CRT when it comes to displaying games?

Only three of the eight LCDs passed our test: Samsung's, Dell's, and Planar's. We felt encouraged at the progress of this technology; after all, don't we all want to ditch heavy, space-consuming CRTs?

Videocards Aside . . .

In addition to our 3D cards and gaming coverage, the May issue was an info-packed one, with three other feature stories and numerous reviews. Senior Editor Gordon Mah Ung performed a high-caliber chipset/motherboard shootout, wherein VIA's new chipsets were pitted against Intel's and nVidia's.

MSI and Asus provided the mobos, and each was judged by four different categories. For Athlon 64 CPUs, VIA beat out nVidia. Not surprisingly, in the Intel CPU-based competition, Intel's 875 chipset smoked VIA.

Project: Budget PC

Closing out our set of features, Editor Josh Norem conducted an investigative look into the world of building budget PCs. As a part of his project, Josh built $500, $1,000, and $1,500 computers, using only off-the-shelf parts, most of which we had to buy ourselves. What he found was that the tension in choosing parts is interesting because it involves carefully weighing price, performance, and expandability. The results were fascinating: The $500 PC sucked performance-wise, but was extremely expandable, and the $1,000 system offered a blend of decent performance and expandability. Unbelievably, our $1,500 rig performed almost as well as the high-end "zero-point" PC we use as a baseline for all our PC testing. In terms of price-performance, that's a big victory.

May Rig of the Month: Marantz 2220B Receiver Case

We'd seen PCs stuffed into all manner of foreign objects—various model cars, a golf bag, a wheel rim, a child-size coffin, you name it. What we liked so much about Alex Wiley's mod winner was the elegant utility of its disguise. The faceplate is the original face plate of a classic Marantz 2220B receiver Wiley bought on eBay.

June 2004

Issue Highlights

Intel surprises techies everywhere when it announces that, by the end of 2004, all of its CPUs will utilize a new naming convention that's modeled after the way BMW names its line of automobiles.

Alienware generates considerable eyebrow raising when the company announces top-secret plans to improve graphics performance by an astonishing 70% *over the next-gen* videocards in its new high-end ALX line of computers.

Google sets *Maximum PC* tongues wagging when it announces its own email service. Dubbed Gmail, the upstart service offers a whopping 1GB of storage—that's five years' worth of messages! Editor in Chief George Jones sets off furious envy when an inside connection gets him on the Gmail beta list.

Finally, finally, finally, 2004 brought some high-quality action games our way. In the June issue, we got our hands on two games that blew us away: *Far Cry* and *Unreal Tournament 2004*. Both blew us away with a combination of stunning next-gen graphics and intricate, entertaining play mechanics.

While we expected great things from the multiplayer mayhem in *UT2004*, *Far Cry* completely took us by surprise. "Oh, for crying out loud, just buy this game!" We proclaimed in the review's headline. Internally, we wondered out loud whether Valve's *Half-Life* had just been trumped. Time would tell.

Perfect 3D Card Timing

The timing for these powerful new games couldn't be better because not two weeks after we began playing *UT2004* and *Far Cry*, we were among the first print magazines in the world to get our hands on not just one but both of the two new videocards scheduled for release in the summer of 2004.

ATI and nVidia were both kind of enough to let us "borrow" early versions of their Radeon X800 XT and GeForce 6800 Ultra, respectively. The purpose was testing for our third annual speed issue (more on that in a paragraph or two), but in order to test 3D videocards, you have to play some games, right? Right.

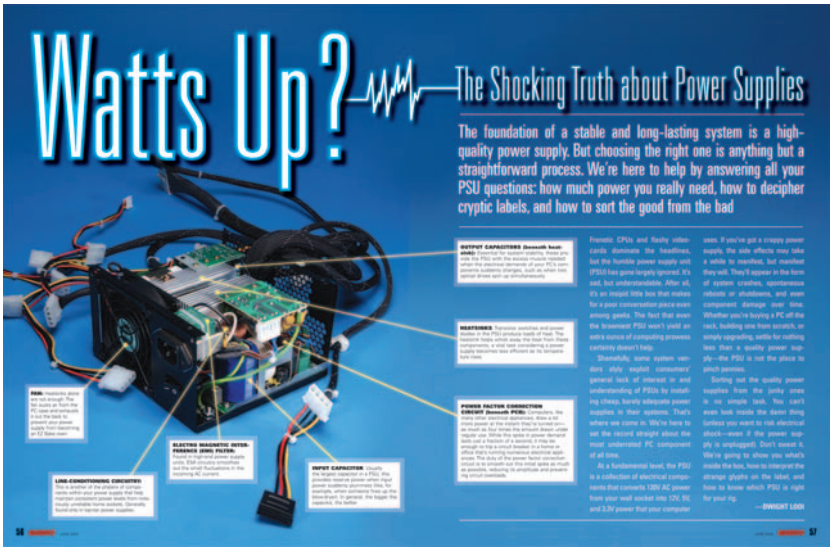
We couldn't believe the results we saw with both cards. Dramatically, our tests indicated that these next-gen cards were more than twice as fast as ATI's and nVidia's previous top-of-the-line cards, the Radeon 9800XT and the GeForce FX 5950 Ultra. We were able to play *Far Cry*, one of the most system intensive games we'd seen at the time, at 1600x1200 with all the details on and experienced nary a hiccup!

Need for Speed

Each of the last three years, the *Maximum PC* Lab has gathered its collective intellectual might together to answer the most critical and topical PC performance-oriented questions. The tradition began in 2002; in our first-ever Speed Issue, we pitted speedy components against each other, and also investigated issues we'd wondered about for years.

This month's batch of speed-related issues included the following questions and matchups:

- **Are two CPUs better than one?** We got our hands on Tyan's oversized dual-proc Thunder K8W motherboard, and what we found is that in many cases, applications aren't built to support dual CPUs, so there's no discernible performance boost. However, for users who do a lot of multitasking, or designers who use applications such as Newtek's *Lightwave 3D 7.5*, which is built with dual-CPU support, there was a difference.


Watts Up?—The Shocking Truth about Power Supplies

The foundation of a stable and long-lasting system is a high-quality power supply. But choosing the right one is anything but a straightforward process. We're here to help by answering all your PSU questions: how much power you really need, how to decipher cryptic labels, and how to sort the good from the bad

- **Which is faster: Intel's Pentium 4 Extreme Edition or AMD's FX-53?** We tested the two CPUs against each other with mixed results. There was no clear winner here, but to us, the FX-53 "felt" faster than the P4EE in gaming, while the P4EE "felt" faster in application performance.
- **Is it worth it to spend extra money on a name-brand USB cable?** We pitted an old USB cable against a USB 2.0 cable and an expensive Monster USB cable, with interesting results: The old USB cable was no slower.
- **Is Serial ATA faster than SCSI?** We've always wondered how our favorite drive—the 74GB Western Digital Raptor drive—would compare to a SCSI drive, so we matched the two against each other in our punishing series of hard drive tests. What we found justified our love: The Raptor dominated the 10K *and* the 15K SCSI drives.
- **Which is faster: nVidia's GeForce 6800 Ultra or ATI's Radeon X800 XT?** This was our title fight, and, true to billing, it went right down to the final bell. We devised a slew of benchmark tests in order to differentiate between the two: *Far Cry*, *Halo*, *3DMark2003*, *UT2003*—everything. And no matter what we threw at the games, both handled the tests flawlessly and—unfortunately for us—equally. Both cards' 16-pipeline architecture allowed them to blaze through each benchmark in record time. ATI's X800 appeared to win all the real-world tests, while nVidia's GeForce 6800 won the synthetic tests. We declared the first round of this videocard shootout a draw: Image quality and other intangibles would have to settle the difference.

"WHEN I FIRST STARTED PLAYING FAR CRY WITH THE X800 AND THE 6800, I COULDN'T BELIEVE MY EYES. I MEAN, 1600X1200 WITH NO SLOWDOWN? MAN!"

—WILL SMITH, TECHNICAL EDITOR

June Rig of the Month: The Cage

As far as we know, a case made entirely from hardware cloth (similar to chicken wire) is unprecedented, though Karl Kaess, its creator, sheepishly admitted to having seen Martha Stewart make a candleholder from the same material. Kaess told us that he designed the PC for other people to copy, and that he hoped to one day see one at every LAN party.

*Top 10 Maximum PC Products

We hereby pick the best 10 products of the last 12 months.

Over the course of the last 12 months, we tested, reviewed, analyzed, and judged well over 300 different pieces of hardware. That's a lot of testing!

As you've probably gathered by now, not every product *Maximum PC* reviews receives high marks. Many well-meaning companies have had their hopes dashed on the craggy rocks of Lab testing, that's for sure. While some products receive high marks, a select few blow us away with benchmarking performance, functionality, or even aesthetic design. These products become immortalized in our minds and our hearts.

Herewith we present *Maximum PC*'s top 10 hardware products of the year.

10 Shuttle XPC SB61G2

The company that created the small formfactor barebones PC proved that experience counts for a whole lot with the SB61G2, which offered support for 800MHz frontside bus P4s, dual-channel DDR, FireWire, and USB 2.0.

9 Saitek P3000 Wireless Gamepad

Yeah, yeah, this controller looks like a *Star Wars* robot. But it's functionality is a high mark for PC gaming controllers. Eight buttons, the *de rigeur* two analog sticks and directional pad, and two trigger buttons. And it's wireless!

8 AMD Athlon FX-53

With tricks such as a full-speed, on-die memory controller, a huge cache, and 64-bit support, this sequel to AMD's original 64-bit FX-51 went toe to toe with Intel's much more expensive Pentium 4 Extreme and held its ground.

7 Plextor PX-708A

Affectionately referred to as the "Plexty" by *Maximum PC* Lab rats, the Plextor stands out in a huge crowd with top-notch access times and unbelievably fast burning speeds.

6 Logitech Z-680

Let's just say it outright: We are completely and utterly infatuated with the Z-680 set of speakers. This 5.1 set sports a flawless subwoofer and satellites that sound like buttah.

5 Toshiba e805 PocketPC

We have two words and a symbol for Toshiba's new top-line PDA: 640x480. The first PocketPC to allow us to surf the Web (via built-in wireless, no less) without having to use the scroll button.

4 Western Digital Raptor 740GD

Is it wrong for a man to love a Serial ATA hard drive? Not if it spins at 10,000 revolutions per minute and is the fastest drive we've ever seen. The 740GD is one of the few products to receive a perfect 10 from the *Maximum PC* Labs over the course of the last 12 months.

3 Logitech MX700 Mouse

We waited a *looong* time to finally see the first great wireless gaming mouse, the MX700 from Logitech. It's been more than a year since we tested it, and we *still* haven't seen a finer wireless mouse we'd trust our virtual lives to in a death match.

2 Apple iPod

Chalk one up for the Mac-heads; Apple's MP3 player is a work of art. A slim design, elegant looks, and the finest interface we've yet to experience on a portable media player made this the finest MP3 player we've ever seen.

1 Dell XPS

When we rounded up the fastest notebooks in the world for our April 2004 issue, we knew we'd be blinded by the speed. But we had no idea that Dell—mainstream, run-of-the-mill Dell!—would hand us a laptop that outraced some of the faster desktops we've seen in the last six months. With a $4,000 price tag, it's expensive, but oh baby!

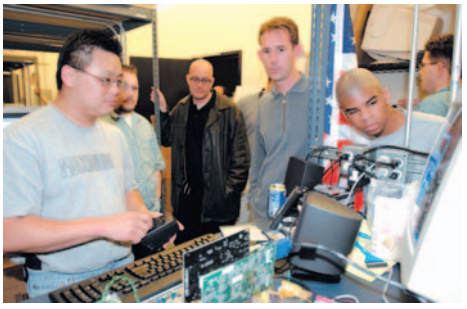
Chapter Two

Maximum PC Standards & Practices

The secret ingredient to our success? Hard work, a healthy obsession with the scientific method, and countless hours spent in the Maximum PC Lab.

The *Maximum PC* Lab is the hub of the magazine. A large portion of the articles, reviews, and feature stories begin their lives here. Each of the Lab's chief personnel has his own workbench, his own pride and joy. Each workbench comes fully loaded with standard primary and secondary testing PCs (also known as "test beds"). Every year, we update the configs of our test beds in order to constantly maintain a high barometer for high-level PC performance.

When the *Maximum PC* Lab moved locations, it involved several weeks of hard labor and rigorous planning. It was worth it—the end result was a highly secured area tucked into an inconspicuous wing of Future US's headquarters. In other words, a dream come true.



When we hosted a *Maximum PC* Reader Day, we invited several lucky readers down to our Brisbane, California offices. The highlight of the day: a detailed tour of our testing grounds!

The unassuming town of Brisbane—a sleepy suburb 15 minutes due-south of San Francisco—is the home of *Maximum PC*'s vaunted testing Lab. Discreetly tucked away between our company kitchen and the desks of the *Maximum PC* editors, writers, artists, and interns, this Lab is accessible to only 10 people in the entire country.

To get into the Lab's heavy-duty, fireproof steel doors, you have to enter a five-digit code. Enter the wrong code three times, and our laser protection system kicks in, deep-frying anyone in the vicinity of the touchpad. (We're kidding about the lasers.)

To this day, many of the unassuming worker bees at our parent company have no idea what lays behind the mysterious steel door in the kitchen. They only know that *Maximum PC* editors occasionally emerge from the door wild-eyed, whispering words quietly to themselves like "unbelievably fast" and "explosion."

The reality is that there's nothing magical about the *Maximum PC* Lab. It's all about hardware, hard work, and a healthy respect for the scientific method.

Our lab has 16-foot-high ceilings and consists of six 6-foot long metallic workbenches. Each bench has three levels—one near floor level for storage, one about eight feet up for extra storage, and a main testing surface. The floor is standard office issue linoleum. The materials on each testing surface vary greatly. Senior Editor Gordon Mah Ung, our mobo and CPU guy, for instance, has a special PC configuration that shuns a traditional PC case in favor of an open-air, rack-mounted configuration upon which motherboards and other components sit exposed to atmospheric elements. This allows him to quickly swap components that traditionally take a considerable amount of time and effort to remove and install.

Other benches, like the one under the care of Technical Editor Will Smith, our videocard guy, have several different rigs and displays. Running two PCs side by side allows him to simultaneously compare visual quality between different 3D cards.

At the beginning of our monthly publishing cycle, the Lab is often jam packed; the editors and writers pile hardware onto their workbenches and commence vigorous testing. As you might imagine, the *Maximum PC* Lab can be a fairly raucous environment during this period. There's lots of smack-talking, joking around, and arguing about methodology and/or results. Well, at least until our speakers guy, Josh Norem, commences his high-volume speaker testing by cranking up the sound levels of games like *Call of Duty* or, more horribly, dropping some '80s pop music into his playlist.

> ***DISCREETLY TUCKED AWAY, THE MAXIMUM PC LAB IS ACCESSIBLE BY ONLY 10 PEOPLE IN THE ENTIRE COUNTRY.***

What's Up with All the Lab Coats?

Regular readers of our magazine are quite familiar with images of editors decked out in *Maximum PC*–branded lab coats. This of course raises the obvious question: Do our technical gurus *really* wear these coats when running benchmarks and hacking up hardware, or are the coats merely props for making our editorial offices look like some kind of R&D center?

Well, here's a secret that you'll only find in this book: Ninety-five percent of our Lab time is spent wearing civvies. Now, we're not going to lie to you. We do indeed have three fully functional lab coats on-site—but they were originally purchased for our interns to wear in their "Lean Machine 2002" photo shoot. These days, you'll find our editors only wearing these coats on special occasions. They're essentially the *Maximum PC* version of military dress blues!

Experimentation, Torture Tests, and Lab Hi-jinks

At other times, the Lab is a tremendous experimenting ground that allows *Maximum PC* editors the opportunity to perform extreme tests on PCs and PC components. Our goal is to determine threshold limits, and gauge the relative performance of PC parts in creatively structured, head-to-head testing.

For example, in the months prior to our annual Speed Issue (in 2004, it came out in June), the Lab is a hotbed of speculation, hypothesis, and experimentation.

Great Moments in Lab History

September 2003: Our very first *Maximum PC* Challenge was the first in a continuing series of hardware stress tests. Dubbed "Memory Meltdown," we overclocked five different sticks of RAM to extreme speeds in order to see which could survive, and which yielded errors. The winner reached an astonishing 526MHz error-free!

February 2004: Have you ever wondered how much bass you'd get if you hooked together 12 100-watt subwoofers? We have, and the answer is "a lot." The resulting noise was pure torture, and literally rearranged our clothing.

October 1996: Looking for a way to test a "fireproof" software safe, an intrepid Lab crew of yesteryear requisitioned a few dozen kerosene-soaked phone books and set the safe on fire. The resulting pyre got hot enough that the asphalt underneath the phone books actually melted. No, the Brisbane Fire Department was *not* amused. Amazingly, the data and media survived intact!

How much faster are USB 1.0 cables than high-speed USB cables or high-cost Monster cables? To find out, we had to devise a series of tests that could accurately measure data throughput. We started with short-length cables, but soon realized that to better expose possible cable problems, we should be using longer ones.

Similarly, when the Watchdog broke news of the IBM Desktar 75GXP class-action suit (which alleged that these drives failed at an alarming rate and that IBM sales representatives knew about the flaws), we decided to test the drives' integrity by setting them up in RAID array for multiple months. Keeping the drives performing at a level of constant, high activity proved an interesting challenge. We eventually created a script that forced the drives to continuously swallow tons of data in the form of Internet web pages. In addition to keeping the IBM drives spinning 24/7, this test also laid the foundation for future long-term drive reliability testing.

The Lab also plays an integral role in our "*Maximum PC* Challenge" features. In these stories, our editors conduct extreme threshold testing on PC components in order to determine the maximum levels of speed, abuse, or performance under which the parts can operate. In November 2003, we overclocked RAM to extreme levels in order to determine the clock speeds that high-performance memory could comfortably hit before yielding errors.

In February 2004, we torture-tested USB keys—a fun diversion that involved freezing the keys in water, washing and drying them at a laundromat, and running them over with an SUV.

Then, in May 2004, we pitted eight flat-panel LCDs against a top-of-the-line CRT monitor to find out if LCDs could finally measure up to CRTs when it comes to displaying fast-moving 3D games. Only three of the eight flat-panels survived.

But not all of our Lab time is devoted to serious testing. In January, Maximum CD producer Josh Norem, the recipient of 12 Klipsch standalone subwoofers, decided to determine exactly how much bass could be generated by stacking and daisy-chaining all 12 of the subs together. The answer, we all found out, was "a lot." The resulting bass explosion literally rearranged his clothing—and generated numerous complaints from our panty-waisted neighbors.

Now that you know everything there is to know about our Lab, let's explore the intricate world of hardware testing and the planning of our monthly review section.

How Does Maximum PC Decide What to Review?

Every month, the magazine publishes between 18 and 30 various product reviews. If that sounds like a lot of hardware and software testing, it is. This is why our Lab is so important. Here's a look at the process involved in deciding what to review, and how to review it.

We publish our magazine monthly, which means that we complete an issue roughly every four weeks. Give or take an odd extra week here and there, this means we each have to always be thinking ahead in terms of product release dates, new technologies, and—most importantly—magazine due dates. It's not easy, but we've worked out a feasible system.

During the third week of each four-week publishing cycle (typically the week before we begin sending pages to the printer), Editor in Chief George Jones asks each of the magazine's four resident technologists to identify the interesting products that are about to break, have already broken, or are about to be released. It's an integral part of each editor's job to separate the proverbial wheat from the chaff, to filter the irrelevant products that our readers just don't care about from the products that fall squarely in *Maximum PC*'s wheelhouse. Thankfully, our guys know their readers well. Respecting the magazine's mission to cover high-end power products, as well as gear that offers astonishing price-to-performance ratios, each editor generates a long list of components that he'd like to cover in some way, shape, or form.

Maximum PC is quite different from most computer magazines—that is, the ones that will review any product, device, or piece of software that gets sent their way. In our minds, the PC-building consumer doesn't have the luxury of receiving free components directly from manufacturers. Instead, they spend countless hours seeking out information on parts, and then they buy the smartest choice with their very own money. So, at *Maximum PC*, our primary objective is to ease your intelligence-gathering process by publishing incisive reviews of the types of components that interest power users the most.

> ***"FOR US, THE LAB IS A SACRED PLACE. THIS ISN'T TO SAY THAT WE DON'T TALK AND LAUGH IN THERE OCCASIONALLY, BUT SERIOUS WORK GETS PERFORMED IN THERE EVERY DAY."***
>
> ***—GORDON MAH UNG, SENIOR EDITOR***

Maximum PC Editorial Maxims

At *Maximum PC*, we assign very few reviews to out-of-house authors. But when we do work with freelancers, we give them the following editorial maxims to ensure they stick to our stringent writing and testing standards. What follows was pulled from actual *Maximum PC* letterhead:

Dear freelancer: Please observe the following guidelines when writing reviews for the magazine. Read these maxims before writing any review, and then check your finished review against this list.

- Make sure every sentence of your review describes the product and/or offers a critical, insightful opinion about the product. No one reads our reviews for shallow asides and useless verbiage.
- Simply listing features, specs, and benchmark results does not a good review make. Make critical observations about the specs and features, and put benchmark results in perspective to the performance of competing products.
- When voicing a critical opinion, make sure you support your opinion with vivid, descriptive examples. Prove to the reader that you're intimately familiar with every nook and cranny of the product.
- Don't run a *Maximum PC*–approved benchmark unless you are positively sure of how it works and what it's testing. If you're not familiar with a benchmark, talk to us and ask for insight.
- Be wise enough to realize that you may not know everything about a subject and that, at any given moment, you may make a gross factual error or fallacious assumption. With this wisdom in hand, learn everything necessary to master the subject at hand.
- Be aware of why a product may perform poorly. Does the product employ an intrinsically bad technology? If so, then knock the vendor's decision to employ bad technology. Does the product poorly implement an otherwise good technology? Then knock the poor implementation. Always put your criticisms in perspective.
- Never take a vendor's claims as the gospel. Verify all product claims that are not immediately tenable.

Now, this isn't to say that we don't review products sent to us—many companies understand our perspective, and they know the kind of gear that interests us (and *you*) the most. But coverage is never automatic. Over the course of each day, week, month, and year, each editor devotes time to scouring web sites, discussion boards, and hardware stores to determine the most interesting products on the market.

Just like the PC enthusiasts who read our magazine, we're hyperfocused on the highest-end components in each product category. Everyday motherboards don't excite us; high-performance mobos do. Ditto DVD burners, CPUs, and cooling systems. After all, do high-performance sports car magazines review Scions or baseline Honda Civics? Sure, every now and then, we do review a low-end product, device, or gadget. But that's necessary for our continuing education in PC componentry: We need a full understanding of the entire market in order to better appreciate what vendors are creating and selling at the high end.

Yes, indeed, naming candidates for possible inclusion in our reviews section is an exciting process. Untested and considered solely on its face-value merits, each product is a potential star. Products that just don't seem newsworthy enough are tossed into our metaphorical not-worth-our-attention bin. But products that do seem interesting are slated for space in our reviews section (though whether they make it out alive with a positive review is another matter altogether!).

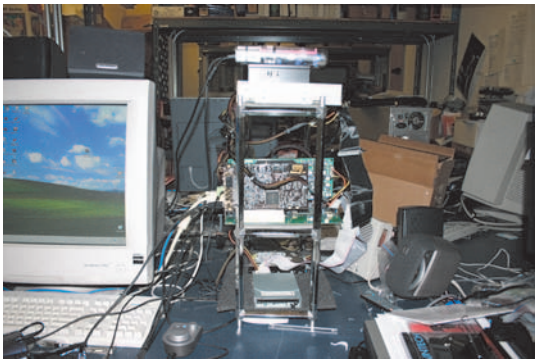
After each editor compiles his initial list and sends it to George, a group discussion is called, and we carefully balance our reviews coverage. It wouldn't do, for example, to have 7 hard drive reviews in an issue of the magazine with just 20 reviews total. Ultimately, George takes all the input he receives from the Lab editors, infuses his own judgment calls, and decides final review assignments. Benchmarking and hands-on testing begins in earnest.

Regular readers may have noticed that, while *Maximum PC* frequently does feature stories on new CPUs and CPU technology, we never officially "review" CPUs. This is due to the fact that CPUs are in a constant state of transition. Imagine the following scenario: Intel comes out with a new processor. Let's call it the Pentium 10. It boasts a new core architecture—one that tests like a complete dog, so *Maximum PC*'s Lab team gives the P-10 a 3 verdict.

October 2003: New Test Beds Established

In order to ensure that our testing practices are producing useful and valuable results for readers who, like ourselves, pride themselves on staying ahead of the technology curve, we periodically revise our benchmarks and our test bed machines. For most of 2003, our test systems were armed with a 2GHz Pentium 4, an Intel D850MV mobo, 512MB of PC800 RDRAM, a GeForce4 4600 Ti videocard, a WD 1000BB hard drive, and a Sound Blaster Audigy soundcard. This configuration probably sounds quaint by today's standards, but when we implemented it in April 2002, it was state of the art.

Heading up the test bed revision was none other than Senior Editor Gordon Ung, who had to navigate through some particularly tough decisions, such as choosing between Intel or AMD for our CPU and chipset. Years ago, we wouldn't have touched any third-party chipset designed for an AMD CPU for our test beds, but by 2003, the times had changed so much that we felt comfortable enough with the platform's stability to go with an Athlon 64 FX-51-based test system.



When the smoke cleared, our test system consisted of the Athlon 64 FX-51 and the nForce 3 Pro 150-based Asus SK8N mobo, 1GB of registered DDR400 memory from Corsair Micro, the ATI Radeon 9800 Pro XT videocard, the 250GB Western Digital WD2500 hard drive, the Audigy 2 ZS soundcard, and the Plextor PX-708A. We announced the new configuration in our December 2003 issue.

Now, at this point, the verdict is essentially chiseled in stone. The Pentium 10 equals crapocalyptic performance. But then the fluid nature of CPU performance takes an upward turn. Turns out that with a new chipset and a faster system bus, the Pentium 10 really comes into its own. All of the sudden, its performance is kick ass relative to AMD's fastest competitive offering. Plus, software developers suddenly start using the P-10's new instructions. The Pentium 10 is now *Maximum PC*'s new best friend—*yet three issues ago, the damn chip received a lowly 3 verdict!*

See the dilemma? CPU performance can only be described in the here and now. Yet review verdicts last forever. They are committed to print and constantly referenced by eager consumers over many months and even years. That's why we always encourage readers to read our CPU features and Lab Notes section for information on which CPU is best right now.

Fortunately, all other PC components are much less ephemeral. Even videocard GPUs typically get name changes when their clock speeds increase.

How We Review Products

During the last week of our magazine's monthly product cycle, in the period when our art directors, managing editor, and editor in chief are frenetically putting the final touches on actual page layouts, the hard work for next month's issue begins in the Lab. This is when the proverbial rubber hits the road. This is when the most rigorous review testing in PC magazine publishing takes place.

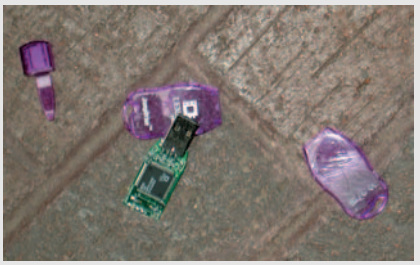
And Sometimes Things Break . . .

The downside to Lab testing—or upside, depending on how you look at it—is that, occasionally, products succumb and break apart. Sometimes products fall to pieces, and other times they make like Cheech and Chong and go up in smoke. When it happens, the whole Lab corps, and sometimes the Lab's neighbors, take notice.

Herewith we present the spectacular, noteworthy, and outright sad moments of product testing in 2004.

March 2004: Speaker Explosion

While testing for the March 2004 issue, Editor Josh Norem ran our rigorous regimen of test tones on Acoustic Authority's A-3780 speakers. The 2.1 set handled the first few tones fine, but in the middle of our 20Hz to 22KHz sweep, we heard a *pop* from the left speaker and noticed a rising wisp of smoke. Doh!

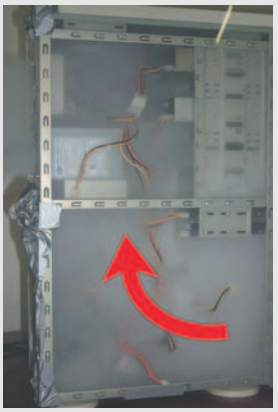


February 2004: USB Key Breakup

In our February issue, we wondered just how durable USB keys are. To find out, we exposed three USB keys (graciously donated by Crucial, Lexar, and M-Systems) to real-world mishaps. During our first round—a 20-foot drop onto cold, hard brick—one of the USB keys shattered into pieces. May it rest in *piece*. (Remarkably, all three of our USB keys survived being rolled over by an SUV!)

September 2000: The Smoke Alarm Incident

In testing case airflow for a feature story, Editors Will Smith and Gordon Ung got their hands on a smoke generator, and essentially broke the entire Future Network offices. The *Maximum PC* Lab staff learned one very important lesson: Anytime someone says, "We're not going to set off the smoke alarm," they probably are. The alarm went off, the building was evacuated, and the Lab found itself in a world of trouble.



GETTING A CODE TO THE LAB DOOR IS A RITE OF PASSAGE. ONE NEW HIRE DESCRIBED GETTING THE CODE AS A 'DEFINING EVENT,' AND INTERNS HAVE NEAR-BEGGED US FOR DIRECT, UNCHAPERONED ACCESS.

—WILL SMITH, TECHNICAL EDITOR

Because we adhere so stringently to the tenets of the scientific method, we think long and hard about our benchmarking strategies before we perform any Lab tests on a piece of hardware. For most components—such as videocards, soundcards, CPUs, optical drives, and wireless access points—our testing process has already been determined by our own internal "benchmarking refresh." During each yearly refresh, we review our benchmarking standards and practices, determine whether they're still fair, valid, and relevant, and then make changes accordingly. We reevaluate existing benchmarks, consider new benchmarks, and dig deep into the actual scripts and test documents used in each benchmark. In general, *Maximum PC* prefers to always use real-world benchmarks. That is, tests that are based on real-world applications and games that our readers use at home themselves. If PC history has taught us anything, it's that wily hardware vendors can develop cheats for synthetic benchmarks that run raw lines of code.

During the yearly refresh, we also reevaluate the config of our baseline test beds. Once we've finalized the profile of our standard test bed, and have nailed down our benchmarks and how they'll be run and reported on, we commit the benchmarking refresh to institutional law, but also remind ourselves to constantly check the validity of each test, month in, month out.

Sounds fair and dandy, right? Well, sometimes we run into products that throw us a curveball, so we need to deviate from standard practice. For example, when Gordon tested the world's fastest notebooks in our April 2004 issue, he determined that our standard notebook tests would be inadequate measures of these power-hungry portables' capabilities. These notebooks were built with high-end gaming and blazing-fast performance in mind. They were designed to offer an alternative to high-end gaming machines—so Gordon decided to use a slightly modified variant of our quite rigorous *desktop* tests. (In case you're wondering, Dell smoked the competition with this new system, even blowing past a desktop PC we reviewed in the same issue!)

The Scientific Method: Why It Must Be Respected!

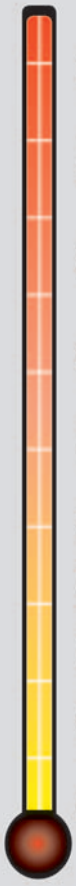
Make no mistake: We don't run benchmarks just for cheap thrills. No, in the *Maximum PC* Lab, we run benchmarks to accurately and fairly compare the performance of similar pieces of PC hardware. It's a serious business—a business in which *your* best interests as a consumer hang in the balance. So to make sure that we properly assess a component's true value, we stick to the scientific method during all Lab testing. In specific terms, this means that all of our benchmarking follows strictly controlled, standardized procedures. If Hard Drive A is tested with a particular software script, on a particular workbench, with a particular stopwatch, then Hard Drive B is tested exactly the same way—repeatedly, to make sure we receive consistent results.

The scientific method also dictates that when comparing the performance of competing products, our editors must do their best to isolate a single variable. For example, when testing two videocards, we install the cards in exactly the same test machine in order to isolate each card's actual 3D rendering capabilities.

Controlled variables. Repeatable results. Empirical evidence. These are the tenets of scientific testing, and if we didn't respect them, then we couldn't very well call the magazine *Maximum PC.*

Maximum PC Verdict-o-Meter

Our product ratings aren't quite as binary as some would think. To help you understand just what a 9, 10, or 2 verdict is worth, we explain the mysteries behind our ratings scale. Keep this chart on hand, because we're only publishing it once this year.



10 The pinnacle of hardware or software excellence. The product demonstrates not only superior performance compared with other products in its class, but also groundbreaking new features or unprecedented attention to detail. Any 10 product is automatically bestowed a Kick Ass Award.

9 An excellent product except for one or two forgivable flaws. Products that receive a 9 verdict may or may not receive a Kick Ass Award—it's up to the editorial board to make that decision. These products are truly among the best of their class.

8 A good effort, but nonetheless a product that exhibits a few flaws or uses slightly outdated technology—an "honest" product that falls below the curve of true excellence. No hardware enthusiast should ever be ashamed to own a product that received an 8.

7 A 7 verdict indicates that you should carefully weigh the costs and benefits of buying the product. These products often come with a frustrating mix of good and bad features.

6 A 6 verdict typically goes to a product that's fourth or fifth best in its category. It more or less works as advertised, but there's no compelling reason to buy it. The product may also suffer from several serious flaws.

5 A beta product foisted onto the public for debugging. We recommend that you pass until the vendor can prove it has corrected the shortcomings.

4 An insult to your PC. The product might have just a single compelling feature amid a range of embarrassing faults.

3 It sucks. It just plain sucks. But because some person somewhere on this planet may possibly have a use for it, it gets a 3.

2 The kind of product that just plain doesn't work the way it's supposed to. It's so bad, it reaches legendary status for its infamy. It's not the absolute worst a product can be, but it's about 2 nanometers away.

1 A product that's so rank-ass awful, it should be immediately returned for a full refund, then reported to the Better Business Bureau or Public Safety Commission. Not only did it *not* work as advertised, it actually caused harm to you or your PC.

We're quite confident that the rigorous nature of our testing sets *Maximum PC* apart from the competition. Indeed, some review organizations place the imaginary bar that represents "good" performance at a midpoint in the performance continuum. These magazines and web sites have the "average" consumers in mind. That's fine for them, but it's not for us. We set our "zero-point" bar much, much higher. We—like our readers—are not interested in average, midpoint results. We're interested in gross, unadulterated speed, and each product's threshold for abuse.

Here's another example: Our speaker tests are notoriously tough, involving a radical frequency "sweep test" that produces sounds from ultra-low levels to frequencies so high they're outside of the range of normal human hearing. Some speaker manufacturers have argued that this testing methodology is unfair, that it's not rooted in what consumers do to speakers in the real world. But we say *no* to that. If our readers are going to spend $700 on a set of 7.1 speakers, it's important for them to know that they can handle anything and everything thrown at them without going kaput.

Now, with that said, it's also important to point out that as we perform our Lab tests, we also conduct less clinical, subjective testing at the same time. In the case of notebooks, we subjectively judge how comfortable the keyboard and mouse pad feels. In the case of speakers, we judge how well they produce tones and surround sound effects in CDs, MP3s, movies, and games. Obviously, not all products are ripe for subjective testing, but the ones that are get the full *Maximum PC* treatment.

The downside of this—well, at least for companies providing products to us for review—is that occasionally our Lab destroys products.

How We Determine a Verdict for the Products We Review

As we come to the end of the testing and hands-on use of a particular review product, we begin formulating an overall opinion of the product, and begin thinking about the actual verdict that will be assigned. This is the moment of truth—the moment when we rate the relative quality level of a product with a single number. Quite often, this is no easy task, mostly because many products and components excel in some categories, but not in others. What kind of rating do you assign to a mouse that

boasts amazing tracking, but isn't ergonomically comfortable? And how do you rate a 2.1 speaker set that sounds absolutely amazing, but is still the third-best 2.1 system you've ever heard?

To answer such dilemmas, we consult the *Maximum PC* Verdict-o-Meter. A rating bible of sorts, this meter clearly specifies the criteria for each verdict number. The rare product that receives a perfect 10 verdict automatically receives our highly coveted Kick Ass award. Products to which we grant 9 verdicts can also receive a Kick Ass award, but it's not automatic. Whenever a product gets a 9, we carefully measure its quality against that of other products in the same category, its level of innovation and performance, and other factors. It's not an easy decision—about half of the products to which we give 9s fall short of the Kick Ass barrier.

So why do we take the review process so seriously? Because we expect that you, fair reader, share our high standards, and that you deserve to know exactly what level of performance and quality you're getting. What's more, our reviews can make or break a product or company's reputation, so it's important that we treat each and every review with meticulous attention to detail and fairness.

The Gut-Wrenching Dilemma

Like it or not, we're a review-oriented society. Formal reviews in newspapers help us determine whether we want to see the latest Brad Pitt epic. Word-of-mouth reviews help us decide whether we want to try that new trendy restaurant. Corporate performance reviews determine how much money we make—or don't make. And, judging by the slew of passionate reader emails I receive every month, *Maximum PC*'s reviews influence your PC purchasing decisions in a gigantic way.

I like to call the reviewing process "delicately straightforward" because analyzing a PC system, antivirus app, game, or any other product requires a delicate balance between opposing tensions: lab results vs. real-world testing, envelope pushing vs. practicality, objectivity vs. subjectivity.

As an example, when we review a pre-fab OEM PC, our impressions are largely based upon how fast it performs in *SYSmark 2004*, our key benchmarking test. But we also take into account the structural integrity and aesthetic appeal of the case, as well as how clean the system's innards are. Reviewing games and software and digital cameras, on the other hand, can feel almost entirely subjective.

Granted, this subjectivity is governed by *Maximum PC*'s emphasis on brutal honesty, speed, power, envelope pushing, and high-end functionality, but product reviews still create many heated conversations every month that feature such choice phrases as *you smell*, *you suck,* and the time-honored **** ***. Hey, sometimes brutal honesty has a price.

Because we tend to focus on high-end products that often reach for next-generation technologies, feature sets, and performance levels, our review ratings

The Kick Ass Award: A History of Rebellion

When our founding editors conceived of the Kick Ass award in 1996, they knew they were taking a risk. Would hardware vendors who received the award feel comfortable putting the logo on their product packaging, and naming it in their press releases? What about our more "gentle" readers? Was the term "Kick Ass" simply too risqué for them? These are all good questions, but in the end, our founders decided to go with their gut instincts: PC hardware fanatics tend to be an impolite bunch, so the magazine had to have an award that spoke impolite language. And thus was born the Kick Ass award, which we bestow upon only the uppermost echelon of products reviewed.

Don't like it? Then don't buy the magazine! It's our Kick Ass award, and it's not going anywhere.

The original logo, patterned in the shape of a PCI card, was used from September 1996 to May 2001.

Conceived amid a sweeping magazine redesign, the "bottlecap" logo appeared only in the June 2001 issue. It was roundly rejected by readers, and even most of our editors thought it sucked!

The current logo has been in use since the July 2001 issue. It's got punch. It's a manly man's logo. We like the cut of its jib.

process is even more gut wrenching for us. Do you penalize a product for executing an amazingly cool, never-seen-before feature that isn't all that practical or is functionally limited? And, conversely, do you penalize products that don't push the envelope, but execute existing technology flawlessly?

Take, for example, our March 2004 issue's review of Toshiba's e805 PocketPC handheld. With a 640x480 display, it was clearly ahead of the PDA tech curve, but unless you use a third-party hack, you can only use VGA mode for a small portion of the device's functionality. So does it get penalized? After much soul-searching, Features Editor Logan Decker decided that the innovation of viewing your PDA in a higher resolution was worth a Kick Ass score.

An even tougher example in that same issue was Senior Editor Gordon Mah Ung's analysis of Intel's new Pentium 4 Prescott CPU. With its advanced architecture, awesome scalability, and increased pipeline, this CPU will likely be a fan favorite within a year or two, but at the time, it lagged behind the company's existing P4 Extreme Edition chip. At the end of much soul-searching, Gordon declared that in the short term, we'd likely avoid Prescott, but that in 12 to 18 months, we'd probably be using it in most of our systems.

But hey, who said reviewing products was easy?

Meet the Lab's Chief Personnel

Now it's time to meet *Maximum PC*'s chief Lab rats. These are the guys who make the magic happen, day in and day out.

GORDON MAH UNG
Position: Senior editor
Beats: CPUs, mobos, memory, soundcards, cases, pre-fab systems

Gordon joined *Maximum PC* in June 1998, bringing in a blunt-nosed, no-bull attitude that has helped shape the magazine's no-holds-barred style. His encyclopedic knowledge of the inner workings of PCs makes him a valuable resource for readers and other Lab personnel. When Gordon puts new CPUs through their paces, chipmakers know their procs will be facing the most strenuous challenges and most critical thinking possible. Ung is also a closet photographer; his racing photos appeared in April 2004's "Faster Than a Speeding Bullet" notebook roundup.

WILL SMITH
Position: Technical editor
Beats: Videocards, Wi-Fi, operating systems, case cooling, keyboards, mice, and other assorted peripherals

Will is a former IT guy with a penchant for the dark art of overclocking and case modding. In July 2000, he moved to San Francisco to realize his lifelong dream of becoming a *Maximum PC* editor. The summer is always a particularly challenging time for Smith—this is when videocard manufacturers such as nVidia and ATI release their annual new graphics processor units (GPUs). One of Will's specialties—PC case modding—saw him travel to Dallas in the summer of 2003 to judge some of the best custom case designs in the country. A Tennessee native, young Mr. Smith is also the primary editor of *Maximum PC*'s "How-To" section, which dispenses valuable do-it-yourself advice in a wide variety of categories.

LOGAN DECKER
Position: Features editor
Beats: Optical drives, MP3 players, media readers, printers, PDAs, and assorted PC gadgets

Keeping track of widely varying standards and compatibilities in the optical drive category is challenging enough. Adding on the rapidly evolving world of MP3 players and other gadgets might drive lesser editors insane, but not Logan. He stays on top of these beats, edits the magazine's "Quick Start" section, and collaborates with Editor-in-Chief George Jones on the magazine's feature stories every month. The son of a NASA scientist, Decker is the resident expert on the mysterious science of audio codecs and CD- and DVD-burning.

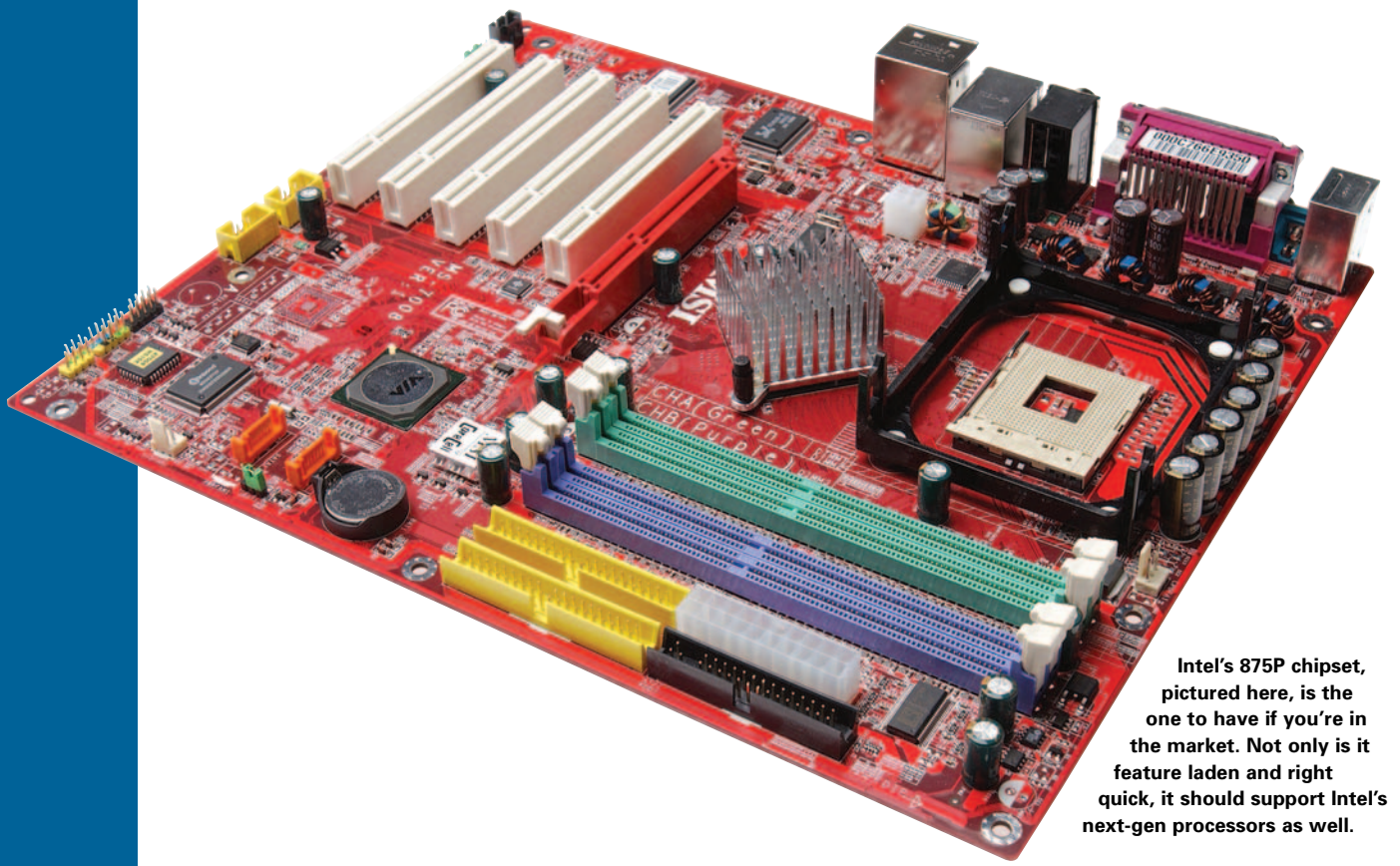
JOSH NOREM
Position: CD and web site producer
Beats: Speakers and hard drives

Josh joined the *Maximum PC* staff in October 2003. Prior to that, he worked in Los Angeles at a motorcycle magazine. Prior to that, he worked at... *Maximum PC*, thus proving to be true the old adage, "You can always go home." The year 2004 was an eventful year for the cagey Lab veteran. Early in the year, he blew out two sets of the same speakers with his notorious speaker torture test, which involves a radical low-to-high frequency sweep. In the spring, Norem took on quite the PC-building challenge: He constructed three lean machines that cost $1,500, $1,000, and $500 respectively. Astonishingly, none of the PCs sucked.

Chapter Three

Motherboards & Core-Logic Chipsets

The foundation of the PC remains steady—and fast. But changes are on the way.

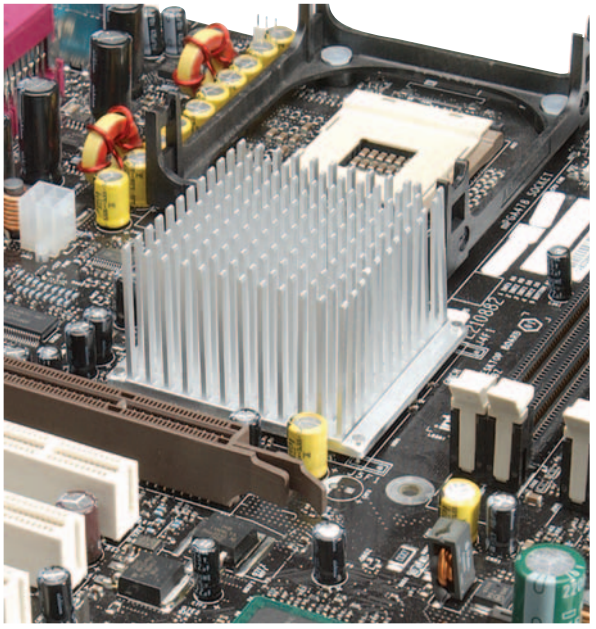


Intel's 875P chipset, pictured here, is the one to have if you're in the market. Not only is it feature laden and right quick, it should support Intel's next-gen processors as well.

The CPU and case enclosure usually dominate the spotlight, but the most important decision to be made when building a PC is choosing which chipset and motherboard your new PC will be built upon.

The motherboard—we often call it a "mobo" for short—is the unsung hero of the modern PC, and is the single most important component because it determines all other hardware selections as well as upgrade options.

The biggest mistake a budding PC enthusiast can make is to underestimate the importance of a well-designed, properly configured motherboard. A PC's motherboard is the technological equivalent of Grand Central Station—virtually everything in the computer connects to it, and in order for your PC to "do" anything the commands always have to be routed through the motherboard. A motherboard determines all future upgrading options, limits how much performance you'll ever extract from your rig, and is the number one factor in your system's overall level of stability.



Upon close examination of a motherboard, you will note two distinct pieces of silicon. One is near the top of the motherboard and the other is near the bottom. These two chips are called the "core-logic chipset," and they really run the show. One of these chips controls things on the top half of the motherboard, while the other handles the data communications of the bottom half. Together they comprise all the features and elements that are "onboard," meaning that they're already on the motherboard. Integrated, onboard features include a LAN port, modem, audio, and even a wireless access point!

What the North Bridge and South Bridge Do

All of the communication between components connected to a motherboard occurs through the board's core logic chipset, which is composed of two chips—the north bridge and the south bridge. The north bridge chip resides near the top of the motherboard, next to the CPU socket, and serves as a four-way intersection connecting the CPU, memory, video card (AGP) bus, and its partner, the south bridge chip. The south bridge chip resides at the bottom of the motherboard, and allows plugged-in devices such as network cards or modems to communicate with the CPU and the memory. The south bridge handles most of a motherboard's "value-added" features—such as the IDE controller, USB controller, and onboard sound and Ethernet.

Mobo Integration Madness

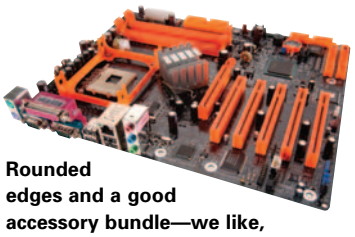
Before we jump into the last year's worth of mobos and chipsets, it's important that we quickly discuss the relative advantages and disadvantages of many of the features that are onboard modern motherboards.

Back in the day, motherboards included nothing but the basics—a PS2 port, serial, parallel and maybe, if you were lucky, a USB port. Nowadays though, motherboards include every possible add-in feature you could ask for: networking, sound, video, RAID, FireWire, multiple USB ports, and more.

> ***"TO THE UNINITIATED, THE MOTHERBOARD IS THE UNSUNG HERO OF THE PC. IT MAKES THE MAGIC HAPPEN."***

DFI LAN Party Pro875

DFI's new LAN Party Pro875 won't just turn your head, it'll stop you dead in your tracks. Sporting radioactive-looking orange components that fluoresce under ultraviolet light, the LAN board is a departure from the company's sedate leanings.



Rounded edges and a good accessory bundle—we like, we like.

DFI doesn't stray far from the Intel reference design. The 875P north bridge is present and accounted for, as is the ICH5-R south bridge and Gig-E support through CSA. The DFI board, unlike the others in this roundup, can also do "1.5" RAID. Using a High Point 372N chip, the DFI lets you set up a RAID array that uses both striping and mirroring, with just *two* hard drives. This feature works via the board's parallel ATA connections, though, so you can forget about using the onboard Serial ATA controller for this feature.

How's this for a system-tweaking feature? DFI embedded power and reset buttons directly on the PCB. This isn't new to the world of mobos (Abit did it with its 845PE series boards), but having immediate access to these buttons sure is handy when you're trying to troubleshoot a problem and your system's guts are all spilled out on the table. A power-user's feature, to be sure. Like the Chaintech 9CJS, the DFI board gives you visual POST codes, but you have to translate them from four LED's on the PCB surface using a table in the manual.

On the audio front, DFI uses a C-Media six-channel codec capable of 18- to 20-bit quality signals. The board's audio performance was slightly inferior to that of the Abit board, but definitely better than what the Asus mustered. DFI didn't include the optional Dolby Digital encoder from C-Media that would let you run the board with a digital decoder box, but because the board is intended for use in gaming rigs, we won't be too finicky about that omission.

Running a 3GHz P4, the LAN Party Pro875 ticks along at 2,995MHz. The Abit goes with 3,007MHz, the Asus 3,030MHz, and the Chaintech 3,043MHz. It's also pretty clear that BIOS optimizations for the new 875P chipset have some wiggle room. Running the latest public BIOS, the LAN Party Pro875 performed like a slower 865PE board.

While the LAN Party Pro875 is relatively slow, it still ran very close to the other two "normal" 875P motherboards here. We just can't forgive the lack of FireWire support, which is requisite in *any* enthusiast-level board.

Originally published August 2003

MAXIMUM PC VERDICT 8

+ ORANGINA

Good accessory bundle and unique RAID feature

– CITRICIDE

Lacks Firewire, stock system bus speeds are a bit more conservative than the other three

$219, www.dfi.com.tw

In some cases, such as with onboard RAID and Ethernet, you get the same level of functionality and performance you get from an add-in card. Having these features built into your motherboard is usually a good thing, since it frees up PCI slots and saves money.

However—and experienced PC testers and builders are already keenly aware of this—integrated components are a mixed bag. As we'll discuss in Chapter 8, "Soundcards," onboard audio offers some conveniences and saves money, but can result in inferior sound quality (many chipsets offer piss-poor audio), and will definitely decrease overall PC performance because the CPU is forced to consume valuable CPU cycles for audio processing.

Similarly, onboard video saves money, but you'll pay a massive price in performance. For one, add-in cards have their own onboard memory to use in games, but integrated graphics chips must share your precious system memory. Even if you have 1GB of memory, that's bad. More importantly, however, integrated video just plain sucks for today's demanding 3D games. If you must have integrated graphics, we can half-heartedly recommend ATI's Radeon 9100 IGP since it's the only chipset that boasts the programmable shaders that next-generation games like *Half-Life 2* and *Doom 3* demand.

This isn't to say that all integrated, onboard features are bad; if we were to build a basic web-surfing system or a media server, we'd probably choose to go with onboard components, because we wouldn't need fancy 3D graphics or high-quality sound.

What We Look for When Testing Motherboards

When the *Maximum PC* Lab reviews motherboards, we focus our testing efforts upon two variables: speed and reliability. These are the two most important attributes of any mobo.

Beyond sheer performance and stability—one of the leading causes of crash-prone computers is poor-quality mobos—we also evaluate the devices and capabilities that have been integrated onto the motherboard. These days, we expect to see a bare minimum of four native Serial ATA ports, Gigabit Ethernet, and decent audio output onboard the mobos we review.

Although we frown upon onboard audio and video, we still evaluate these integrated components; if it's there, after all, it needs to be judged.

Lately, we've been enthused to see that motherboards are beginning to integrate onboard RAID and even wireless access points. Some mobos we've seen even feature built-in firewalls.

One final, but significantly smaller category we judge is appearance. With the prevalence of clear-sided and transparent cases on the market, looks mean a lot to some people, so we make sure to identify which mobos sport nice-looking colors and much sought-after bling.

How We Test Motherboards

To test the performance of the boards and chipsets, we run our usual suite of tests that stress memory bandwidth, the CPU, and hard drive performance. We use *SYSmark 2004* (for extensive information on this all-knowing benchmark, turn to page 146) to gauge application performance. For games, we run *Quake III Arena*, *Unreal Tournament 2003*, *3DMark2001 SE*, and *AquaMark 3* benchmarks. We use *SiSoft Sandra 2004* to measure memory bandwidth, and we also throw in *Premiere Pro*, SPEC's *ViewPerf 7.11*, and our standard *Photoshop 7* test for good measure.

Mobo Buying Tips

On the market for a new motherboard? Or maybe you're just curious? Follow our advice and you'll never go astray. You also won't waste any money.

- **Most important features**: Chipset aside, there are certain basic features you should look for in any P4 motherboard. For one, you'll want support for dual-channel DDR400 memory. When sticks of memory are installed in pairs in a dual-channel-capable motherboard, the effective memory bandwidth of the system is doubled. This nifty trick works with standard DDR memory—no expensive special memory is required. The Pentium 4 processor thirsts for the bandwidth afforded by dual-channel DDR; when sandbagged by single-channel memory, the P4 loses much of its performance edge.
- **Support considerations**: You'll also want to make sure the motherboard you choose can support the CPUs of today and tomorrow. Don't even consider a mobo that can't get on the 800MHz bus or run a 3.2GHz Pentium 4, which is likely to be the final Northwood core CPU released. Other than that, look for a mobo that supports AGP 8x and features a retention clip to keep your videocard snug in its slot. Also, most motherboards released in the past few years feature a clean, jumperless design whereby key settings such as FSB speed are accessed through the BIOS. We still see evil mobos that use jumpers or DIP switches, so make sure you get one that's jumperless. Finally, insist on a board that offers USB 2.0 and FireWire I/O, so you'll have high-bandwidth connections to your MP3 player, digital camera, external hard drive, and any other peripherals you may have that support these high-bandwidth connections.
- One final note: It's probably a good idea to avoid buying socket 940 mobos. By the time you read this, the pending shift to socket 939 will have rendered them obsolete.
- **AMD mobo considerations**: For folks running one of AMD's 64-bit processors, which feature on-die memory controllers, memory support is contingent on the CPU rather than the chipset. Both the regular Athlon 64 and the faster Athlon 64 FX support DDR400 memory (and the FX offers dual-channel capability as well). For best results, don't use anything slower.
- **Intel mobo considerations**: On the Intel front, you'll want to pair your Pentium 4 processor with dual-channel DDR400 memory for maximum performance. P4 chipsets offering dual-channel DDR400 support include Intel's 875P, 865PE, and 865G, ATI's Radeon 9100 IGP, VIA's PT600 and PT880, and SiS's 655FX. Of all these chipsets, only the 875P, 865PE, and Radeon 9100 IGP carry our recommendation.

In an effort to reproduce "real-world" conditions, we assiduously try to avoid using engineering samples; essentially hand-made by mobo manufacturers, these early boards can be tweaked and rarely match the results of the final product. Instead, we rely on production-quality motherboards from two top manufacturers.

When possible, we try to use the fastest possible CPUs for testing. For our "VIA vs. the World" mobo feature in the May 2004 issue of *Maximum PC*, for example, we used a 3.4GHz Pentium 4 Extreme Edition for the Intel chipsets, and the new Athlon 64 FX-53 in Socket 940 boards for the AMD tests.

It's critically important that, during testing, we isolate variables by using the same hardware components and drivers across the board.

Careful Considerations for New Mobos

If you're in the market for a new motherboard, you must also worry about new technologies looming on the horizon. We're amazed at the rate with which the mobo has mutated. Constantly evolving and continuously being released, new technologies like CPU sockets and networking features can make your shiny new purchase obsolete before you can even get home from the store.

This last year has probably been both the worst time *and* the best time in years to invest in a new mobo! It's the worst time because in the next few months we'll see the emergence of an entirely new memory technology (DDR-II), peripheral bus (PCI Express), and motherboard formfactor (BTX), as well as new CPUs from both AMD and Intel that may not be compatible with all current mobos. These new technologies will make everything on the market now "yesterday's news" overnight. (We'll discuss these future technologies in the "Looking Ahead" section at the end of this chapter.)

MAXIMUM PC KICK ASS PRODUCT

Chaintech 9JCS Zenith

Chaintech went nuts with the accessories and features on this board. In addition to the screwdriver and SATA data/power cables, it also includes PATA cables, a bay-mounted media reader, front-mounted USB and FireWire ports, *and* a remote control and LED read-out!

With this Chaintech board, you not only get the motherboard, you get a screwdriver, SATA data cables, and SATA power cables.

Like the other three P4 boards reviewed this month, there's the full 875P chipset with the ICH5-R south bridge for RAID support. Chaintech includes support for Intel's CSA LAN, and for good measure throws in a RealTek Fast Ethernet controller. This dual-LAN arrangement gives you the ability to run the board as a router without having to add any PCI cards.

Chaintech actually ran out of room on the board, so it added a small daughterboard bearing additional audio jacks, an optical SPDIF out, and two FireWire ports. Compared with our other contenders, the 9JCS Zenith is lacking only in dual-RAID functionality.

The Zenith is the first mobo we've tested that includes a VIA Envy24PT chip, which supports 24-bit audio. Don't assume you're getting a full DSP, though, because the Envy24PT is a host-based solution. What's more, while the VIA chip may sport 24-bit capability, Chaintech limits the Envy24PT by using a VIA VT1616 codec. This codec supports six audio streams, but is limited to 18-bit support only!

We were confused by the audio drivers Chaintech included. Once the initial drivers were installed, we were unable to tweak environments or change the speaker setup. Also, of the three P4 boards we tested, only the Zenith was unable to run *Unreal Tournament 2003* when 3D audio hardware was enabled.

Performance-wise, the Chaintech put up mighty fine numbers. In fact, it was one of the fastest we saw back in August 2003.

There's just once catch with the 9JCS. The price. The accessories aren't free, Homer. Chaintech wants you to shell out $269 for its board. The street price will likely be lower, but that's a pretty penny for a motherboard, even if it *is* a six-layer design. Worse still, the Chaintech features the shortest warranty period (just two years) of all the boards in the roundup. Nonetheless, we love the "give 'em everything" approach, and considering the board's solid performance, we doubt you could want much more from an 875P mobo.

Originally published August 2003

MAXIMUM PC VERDICT 9

FOREMAN GRILL

Fast, packed and stacked with features

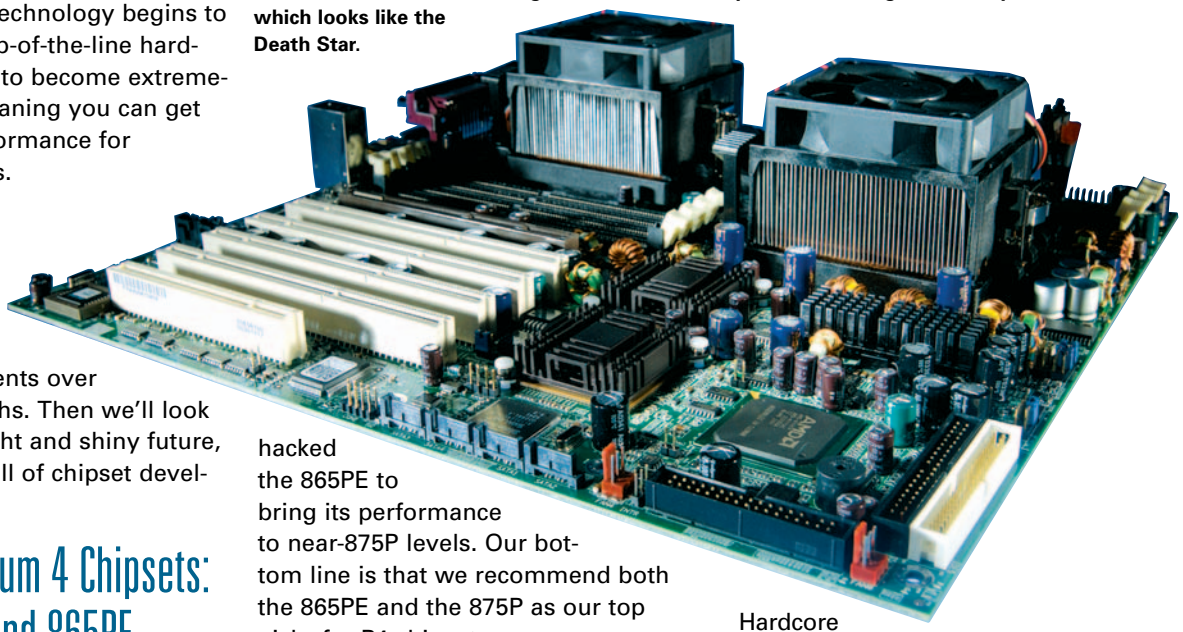
FLOWBEE

Expensive, strange audio choices and we're not big fans of baby blue

$269, www.chaintech.com.tw

The good news, however, is that as newer mobo technology begins to arrive, today's top-of-the-line hardware has started to become extremely affordable, meaning you can get high quality performance for reasonable prices.

Let's take a look at the major chipsets available and the major developments over the past 12 months. Then we'll look ahead to the bright and shiny future, which is chock full of chipset developments.



Every now and then, we get in a monstrosity of a mobo. Such was the case in mid 2004. In order to test a dual-CPU rig for our June 2004 Speed Issue, we got in this Tyan mobo, which looks like the Death Star.

Our Top Pentium 4 Chipsets: Intel's 875P and 865PE

In mid-spring 2003, Intel released its 875P chipset, which quickly became a classic. Featuring an 800MHz frontside bus and a dual-channel DDR400 memory controller, this chipset, which also features AGP 8x and Hyper-Threading, and is optimized for usage with the Pentium 4 as well, has been a mainstay in our mobos for the last 18 months.

While the 875P is Intel's top-of-the-line offering, Intel targeted the 865PE toward the more dollar-conscious budget market. Released in May 2003, the 865PE supports the same technologies as its slightly older and more powerful sibling, but can't sustain the same level of performance.

However, many motherboard manufacturers have successfully hacked the 865PE to bring its performance to near-875P levels. Our bottom line is that we recommend both the 865PE and the 875P as our top picks for P4 chipsets.

One final and important note: Intel chipsets have long been the gold standard for reliability and compatibility. Refreshingly, this means that you will see a paucity of mobo-related crashes or malfunctions—a circumstance that almost brings tears of joy to our eyes.

Also Solid: ATI's Radeon 9100 IGP

Another chipset we've expressed appreciation for is ATI's Radeon 9100 IGP, which is another excellent chipset. It supports all the latest technologies—dual-channel DDR400, 800MHz FSB, AGP 8x, Hyper-Threading—and also boasts an integrated graphics core.

Hardcore gamers and true performance enthusiasts will want to buy an add-in graphics card, but if your budget is tight, the 9100 IGP offers the best integrated graphics core of any chipset on the market. It's also the *only* chipset with integrated graphics to offer programmable shader support (which you'll need if you want to see next generation games like *Doom3* and *Half-Life 2* in all their glory).

Pentium 4 Chipset Pretenders

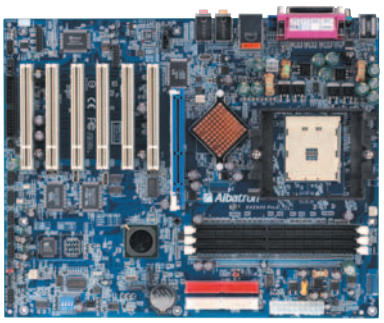
Now let's look at the pretenders—the P4 chipsets you'll want to avoid at all costs. In our minds, Intel's 865G and 865P chipsets are the bastard children of the 865 family. The former offers a GeForce2 MX-level integrated graphics core, but lacks the

"IF I TEST A MOTHERBOARD THAT DOESN'T HAVE AT LEAST FOUR NATIVE SERIAL ATA LEADS, IT'S GETTING DINGED."

—GORDON MAH UNG, SENIOR EDITOR

Albatron K8X800 ProII

Albatron didn't skimp on the features when it forged the K8X800 ProII motherboard. It sports FireWire by way of a VIA VT6037 controller, a dual-BIOS feature that lets you recover your board should you nuke it during a failed update attempt, and even 24-bit audio (well sort of).



The K8X800 sports a ton of features, a dual-BIOS feature, and 24-bit audio.

There's also a crapload of USB and FireWire headers on the board. Albatron even gives you a whopping six PCI slots—a pretty rare occurrence in motherboards these days. We're not sure what you'd fill them with, but hey, the more the merrier.

The board uses VIA's K8T800 chipset and VT8237 south bridge with SATA RAID. The VIA VT8237 also provides Serial ATA and RAID, but unfortunately lacks native SATA like Intel's 865/875 series. That means you'll need to have a floppy drive and a set of drivers ready when you install XP. With boards using the Intel south bridge, Serial ATA drives can be used as seamlessly as a parallel drive. Count this as a negative in the VIA chipset column.

The K8X800 ProII's biggest strength is its performance. In Lab testing, it solidly spanked the competition. Granted, we're talking small percentages—but the K8X800 ProII clearly led the field in most of our tests.

The only snag we ran into with the K8X800 ProII was when we filled all its DIMM slots. It choked on three 512MB modules but mysteriously ran fine when we put 256MB modules in their place. We initially suspected a defective mobo, but later came to believe that the K8T800 chipset is far more finicky with memory then we expected. It appears that three 512MB modules are more than it can handle. Interestingly, MSI's K8T Neo had similar, albeit more severe, problems. More on that later.

Of the three boards here, the K8X800 ProII has the most sophisticated audio. Using an Envy24PT chip, the board supports up to 7.1 audio. The board is also the first we've seen to offer partial 24-bit audio. We say partial because the 24-bit only works on the SPDIF-out via a Wolfson CODEC. The multichannel analog is handled by a VIA VT1616 codec that caps at 18-bit audio. Bummer. This means no 24-bit 7.1 sound. We still haven't seen a full 24-bit audio implementation from a motherboard vendor but expect to later this year when Intel's next-generation audio technology, code-named Azalia, hits the streets.

Originally published March 2004

Albatron K8X800 Pro II

MAXIMUM PC VERDICT **9**

BATTLESTAR GALLACTICA

Partial 24-bit audio and dual BIOS.

BUCK ROGERS

Not as compatible with memory as AOpen motherboard, and lacks a socketed BIOS

$130, www.albatron.com.tw

raw performance of the 865PE, while the latter is restricted to frontside bus speeds of just 533MHz.

Meanwhile, from outside the Intel camp come the VIA PT600 and SiS 655FX. Both are dual-channel DDR400 offerings with 800MHz FSB support, but neither can match the speed or robustness of Intel's finest.

Our P4 Mobo Recommendations

You've already read about our favorite P4 chipsets. Here's a quick breakdown of our favorite P4 motherboards.

Intel D87PBZ: Built on the new 875P chipset, this board introduced Intel's move to dual-channel DDR400 RAM. It showcases a host of new goodies, including an 800MHz system bus, 8x AGP, native Serial ATA support, and a special port that hooks gigabit Ethernet directly to the north bridge. The Bonanza board also features the ICH5R south bridge, which adds soft RAID Serial ATA to the equation as well. Outfitted to appeal to the moderate tweaker, Intel has included a "burn-in" mode that's really just an overclocking switch. Sure, the feature offers just a 5 percent overclock, and the switch doesn't let you juice up your voltage, but this protects nutjobs from frying their CPUs, and maybe that's for the best.

Chaintech 9JCS Zenith: Chaintech took the Ginsu knife approach with its 875P motherboard bundle: You not only get the motherboard, you get a screwdriver, SATA data cables, and SATA power cables. You also get a full set of rounded Parallel ATA cables, a bay-mounted media reader, and front-mounted USB and FireWire

ports. And if you order now, you also get an infrared remote control and an LED read-out that displays the POST codes as you boot. We love this mobo because it has plenty of features: RAID, CSA-LAN, *and* an Ethernet controller. It also has optical SPIDF out and two FireWire ports.

The Back Story: Summer of Athlon XP

Prior to AMD's ground-breaking release of the Athlon 64 at the end of the summer in 2003, the Athlon XP was the cost-conscious CPU of choice. There were really only two companies making performance chipsets for this platform at the time: nVidia and VIA. While chipset manufacturer SiS also made Athlon chipsets, they were targeted at the budget market, and weren't as refined or feature-filled.

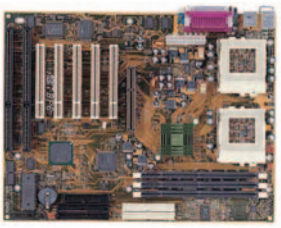
Back then, nVidia's nForce2 Ultra earned our highest recommendation in this category, with such features as built-in Dolby 5.1 audio, 10/100Mbps LAN, AGP 8x support, a dual-channel DDR400 memory controller for maximum memory bandwidth, and optional GeForce4 MX-level integrated graphics. VIA's KT400A offered DDR400 memory support, but only in single-channel configurations, and also lacked 400MHz FSB support. Unfortunately, VIA's reputation for stability problems, which the company would attempt to address toward the middle of 2004, made us slightly tentative.

Our top mobo picks for the Athlon XP platform were the Asus A7N8X Deluxe and the MSI K7N2 Delta-ILSR.

Of course, late in the summer of 2003, AMD rocked our world with 64-bit computing. Let's take a look at those chipsets and motherboards.

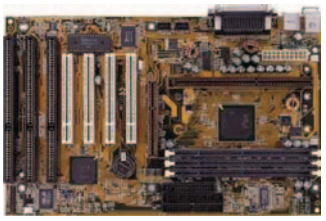
Our Favorite Mobos of All Time

One of the nice things about working at *Maximum PC* is that over the years, you get to see the vast majority of products within most of the major component categories. These are our favorite mobos of all time:



Abit BP6: Abit'x BX6 was arguably one of the most favored motherboards for overclockers back in the day, but the company's BP6 was really a head turner. This rogue motherboard let you do what Intel said was strictly verboten: run dual Socket 370 Celerons. To Intel's chagrin, many, many dual cellie boxes were pressed into service as poor-boy rendering boxes and workstations.

Asus P2B: In the late 1990s, Intel's Pax Pentium II was firmly entrenched not only because of the Pentium II's stellar performance, but also because of the rock-solid foundation laid by the much beloved 440BX chipset. Many 440BX motherboards are dear to us, such as the Abit BH-6/BX-6 series, but Asus's P2B solid reliability and excellent performance makes it a personal favorite.



MSI 6167: In many ways, MSI's 6167 motherboard was nothing special to write home about. Based on AMD's in-house 750 chipset, the board wasn't even close in maturity to the competing 440BX motherboards of the day. But what the 6167 lacked in bling, it more than made up for in courage. Because most motherboard vendors were fearful of retribution from Intel, Athlon boards were few and far between. The MSI 6167 (as well as FIC's SD-11 and Gigabytes GA-7IX) existed, which in turn made it possible for the Athlon XP and Athlon 64 to even exist.

Enter the 64-bit Chipset

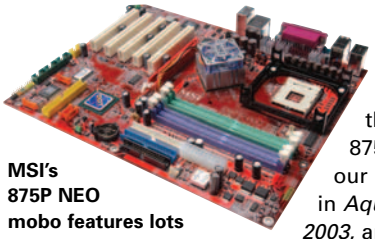
It's safe to say that, once AMD released its Athlon 64 and Athlon 64 FX CPUs, we quickly lost interest in Athlon XP chipsets and motherboards. It's not that they were suddenly horrible; it's just that, well, we love speed.

The big change in this new chip architecture was AMD's decision to move the memory controller—one of the biggest variables affecting chipset performance—to the CPU die itself. This made for a nice little performance boost.

Whereas the Pentium 4's frontside bus canters along at 800MHz, the Athlon 64's runs at full CPU speed—that is, 2.2GHz for a 2.2GHz processor. Furthermore, AMD estimates that its integrated

MSI 875P NEO

With its sexy-looking PCB and fun, multicolored AGP, IDE, and RAM slots, MSI's Intel Socket 478 motherboard is festive. We're not typically huge fans of bling, the 87P Neo's heatsink fan, which lights up in stylish blue and red colors, takes the cake.



MSI's 875P NEO mobo features lots of features, a powerful memory controller, and a tasteful touch of flashiness.

This mobo is brimming with features: FireWire 400 with support for two six-pin ports using VIA VT6306 silicon, eight High Speed USB 2.0 ports, and optical and coax SPDIF running off an ADI1980 audio codec. Also present is dual SATA, which uses the capabilities of the Intel 875P south bridge and an additional Promise PDC 20378 chip. Finally, there's full Gigabit support that uses Intel's CSA for top networking performance. MSI also equipped the board with its signature "D" bracket, which features four LEDs that indicate what goes right—or wrong—when you boot your PC.

The 875P features "Performance Acceleration Technology." This sounds neat, but from what we can tell, this is really just a matter of Intel grabbing the best chips from manufacturing and running them at higher internal clocks.

Because the CPUs for these chipsets don't have memory controllers embedded in them (like the Athlon 64 FX), the memory controller plays a more critical role in overall performance. When Intel released the 875P, the company wanted to own the fastest DDR performance out of the gate; thus far, the chipset hasn't disappointed. We tested the 875P against VIA's PT880 chipset (on a MSI 875P NEO mobo), and the 875P won most of our benchmark tests. Intel's chipset won handily in *AquaMark 3*, both *3DMark2001* and *3DMark 2003*, and *Unreal Tournament 2003*.

Oddly, we witnessed a score we're at a loss to explain: The PT880 crushed the 875P in our *Quake III Arena* tests. Its *QIIIA* scores even bested the extremely fast Athlon 64 FX-53/K8T800. Why doesn't this performance translate into the other gaming benchmarks? We're not sure, but our Lab is dutifully investigating the phenomenon.

In application performance testing, the 875P beat out the PT880 by 2 to 3%. That's pretty darn good. Features, looks, performance, and Intel's famous stability make this chipset tough to beat.

Originally published May 2004

MSI 875P NEO

MAXIMUM PC VERDICT 9

THE MATRIX

Great features, dual RAID, solid performance

THE MATRIX: RELOADED

Could benefit from having 24-bit audio

$80, www.msicomputer.com

memory controller gives the Athlon 64 a latency of just 50 nanoseconds, or about half that of a Pentium 4 running on an 800MHz bus.

Moving the memory controller onto the CPU die also created some interesting ramifications for the entire family of Athlon 64-based chipsets. This shift essentially reduced the variance among chipsets and motherboards across the board. While this has made our head-to-head mobo comparisons in this category less exciting, it does mean that, across the board, users will get consistent performance. This essentially reduces the buying decision to one central factor: features.

Why Hasn't Intel Integrated the Memory Controller?

Given the very tangible benefits of an integrated memory controller, it would seem obvious that Intel would follow AMD's lead in the near future, right? Wrong. Chip design is all about making tradeoffs—adding more circuitry (such as a memory controller) to a CPU can make it faster, but it simultaneously decreases yields and drives up the cost of the processor.

For the time being, it would seem Intel has chosen to focus on other methods of improving CPU performance. Intel could plausibly add an on-die memory controller in the future, but it would be more of an economic decision than anything else.

One of our current favorite Athlon 64 and Athlon 64 FX mobos is Albatron's K8X800 ProII. Based on VIA's K8T800 chipset and VT8237 south bridge, the K8X800 sports native SATA RAID, FireWire, a dual-BIOS feature that allows you to recover your board if you accidentally nuke it, and a slew of USB and FireWire headers.

Just before press time, nVidia released its new nForce3 250Gb chipset for the Athlon 64-series.

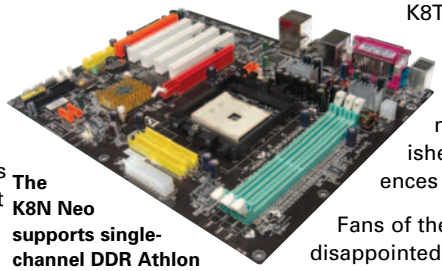
The 250 quickly earned our respect with the addition of native Gigabit support, native serial ATA, and software support for RAID 0, 1, and 0+1. For a more comprehensive review, see the sidebar on this page.

Looking to Overclock?

Hoping to overclock your system to get the most from your investment? If so, there are a few additional motherboard features you'll want to look out for. For instance, the ability to adjust frontside bus speeds and clock multipliers through the BIOS is very desirable. Some mobos still use jumpers or DIP switches for this task. Even worse, others simply don't allow you to overclock at all—so make sure you're getting the real deal.

Lately, some motherboards have begun offering the ability to adjust memory and FSB speeds independently of AGP and PCI bus speeds. If you're planning significant overclocking, this is a feature you'll definitely want to have. Traditionally, overclocking the frontside and/or memory buses resulted in the AGP and PCI buses being overclocked as well, thus increasing the number of possible failure points. A motherboard that allows your AGP and PCI devices to run at spec even when other parts of your system are overclocked significantly increases your chances of overclocking successfully.

MSI K8N Neo Platinum Edition



The K8N Neo supports single-channel DDR Athlon 64s in Socket 754 trim.

Sometimes you have to make sacrifices to be first. Such was the tale of the first Athlon 64 chipset, the nForce3 Pro 150. It lacked native Serial ATA, Gigabit Ethernet, and a high-speed HyperTransport link. Yawn.

MSI's K8N Neo Platinum Edition mobo, which uses nVidia's new nForce3 Pro 250Gb chip, aims to correct these previous blunders. Like the nForce3 Pro 150, the nForce3 250Gb is a single-chip solution (a benefit of having the memory controller for the Athlon 64 series on the CPU itself), which offers improved latency over the standard two-chip design that Intel and VIA use. But unlike the nForce3 Pro 150, the 250Gb's single chip boasts a Gigabit Ethernet core, which is even faster than Intel's blazingly fast CSA port and far superior to any PCI-based card.

Another improvement afforded by the new nForce3/K8N Neo product is a faster HyperTransport link between the CPU and the chipset. Although we've never been able to prove that the nForce3 150's 600MHz link hurt performance, the 250Gb supports a more confidence-inspiring 800MHz link, and can be bumped up to 1GHz.

In Lab testing, the K8N Neo ran faster than the Soyo CK8 board we used in June 2004's speed trials, but the difference was far from spectacular. In our real-world gaming benchmarks, the K8N Neo also outpaced VIA's K8T800-based Albatron K8X800 Pro II mobo, but again just barely. That's the nature of the Athlon 64 platform—the memory controller's placement on the CPU has greatly diminished the potential for performance differences among competing chipsets.

Fans of the nForce2's APU audio system will be disappointed that nVidia didn't include the real-time Dolby Digital encoding capabilities in its new chipset; the nForce3 offers a snazzy built-in hardware firewall as a consolation.

The K8N Neo also packs two parallel ATA133 ports, four Serial ports, and a rather unique RAID arrangement. You're offered RAID 0, 1, and 0+1 but, unlike conventional implementations, the K8N Neo lets you create a RAID partition across SATA *and* PATA drives. Using this capability on our evaluation board felt clunky—for example, it took us five minutes just to figure out which drive was on which chain before we could activate the RAID—but nVidia says its *NVRAID 2.0* software will move the work out of the BIOS and into the operating system. Unfortunately, running RAID still requires the use of F6 drivers.

Originally published July 2004

MAXIMUM PC VERDICT 9

FORMFACTOR

Flexible RAID options, native Serial ATA support, and a built-in hardware firewall.

FEAR FACTOR

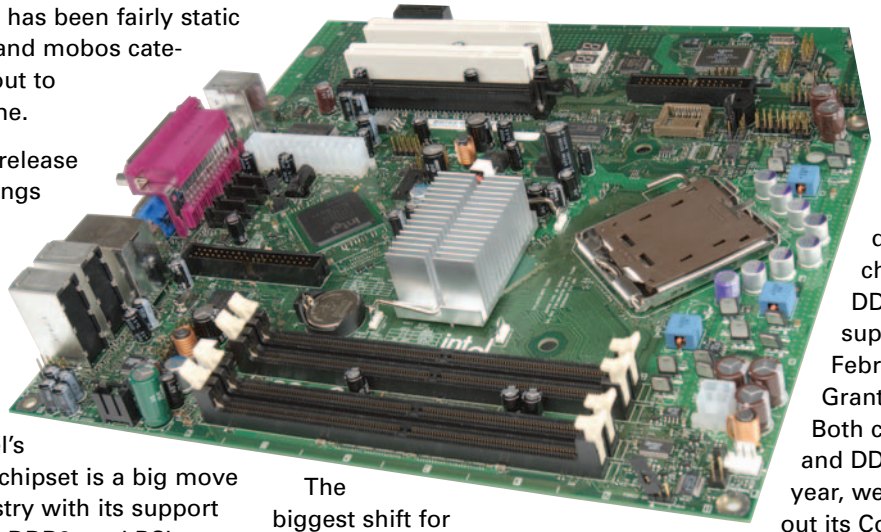
Black PCB isn't quite as flashy as the red PCBs MSI normally uses. No APU audio.

$150, www.msicomputer.com

Looking Ahead: Future Chipsets & Mobos

THE NEXT YEAR WILL BRING NEW CHIPSETS, SOCKETS, AND MOTHERBOARDS

BTX is Intel's new specification for motherboard and case design. The goal: increased cooling.



The last year has been fairly static in the chipsets and mobos category; this is about to change—big-time.

The first big release of the year belongs to Intel, and should be available by the time you're reading this. Code-named Grantsdale, Intel's upcoming new chipset is a big move for the PC industry with its support for PCI Express, DDR2, and PCI Express for Graphics, the upcoming replacement for AGP.

Grantsdale supports both PCI Express—a serial bus that promises much higher data transfer rates—and PCI devices. It also dumps AGP in favor of PCI Express for Graphics. Grantsdale is paired with Intel's new south bridge, the ICH6, which adds a crap-load more USB and Serial ATA ports. The chipset should also support both DDR and DDR2 RAM types.

The biggest shift for Grantsdale, however, is that it features the debut of Intel's High Definition Audio, which integrates high-quality, 7.1, 24-bit sound capabilities onto the motherboard. While you'll still want to use a soundcard in order to avoid the CPU performance hit onboard audio creates, this development means that you won't have to spend megabucks on an add-in card to get rich, vibrant sound.

VIA Makes Its Move

VIA will also try to outflank Intel by introducing its PT890 chipset, which offers DDR2 and PCI Express support, as early as February—before Grantsdale hits the street. Both chipsets support DDR and DDR2 RAM. Later on this year, we expect Intel to roll out its Copper River chipset, which is cloaked in mystery.

Interestingly, VIA made a strong attempt during the first half of 2004 to reestablish itself as a power player. Just before this book went to press, VIA released two new chipsets—the K8T800 for the Athlon 64 FX and the PT880 Neo for the Pentium 4—expressly designed to compete in the high-end performance category. How did the company fare? Read our review of the Albatron K8X800 on page 48 to find out.

"HIGH DEFINITION AUDIO IS GOING TO BE INTERESTING. THE QUALITY LEVEL IS SO HIGH, THAT IT COULD PUT A LOT OF PRESSURE ON CREATIVE—THE LEADING SOUNDCARD MANUFACTURER IN THE MARKET."

—GORDON MAH UNG, SENIOR EDITOR

Prepare for BTX

The other big shift we're just starting to prepare for is BTX. Designed by Intel with increased thermal efficiency in mind, the BTX spec rearranges the mobo and PC case enclosure. The placement of the CPU has been positioned in such a way that it will be the first PC component to be cooled. Additionally, the memory slots have been realigned in such a way that air flows around them, rather than being forced over them. We don't expect BTX to be prevalent for at least another two years, but the spec will be readily available by the beginning of 2005.

New Sockets Forthcoming

Both Intel and AMD plan on new socket releases during the second half of 2004. Each should be available by the time you read this. Here's a breakdown on each:

Intel's Socket LGA-775: Intel's upcoming new socket is an interesting one because in it, the pins are actually on the socket and not on the CPU! This should make for easier installation; the old method required so much force to lock the CPU into the socket that it occasionally would warp mobos. With Socket 775 CPUs, you only have to lightly push the clamp down.

AMD's Socket 939: AMD's introduction of 939-pin Athlon 64 and Athlon 64 FX CPUs in the early portion of the summer of 2004 means you'll likely be able to purchase variations of this faster socket by the end of the summer. It's so fast that new Socket 939 Athlon 64 CPUs will have only 512KB of cache—socket 754 Athlon 64s had 1MB of cache. We anticipate that ASUS's A8V will be the first Socket 939 motherboard. The A8V will also feature a 1,000MHz HyperTransport Link.

Mobo Chipset Fun Facts

Q: What are the throughput speeds of all the major data buses in a PC?

A: **Frontside (Memory) Bus**: The frontside (memory) bus carries the data flowing between the CPU and the memory controller. Throughput depends on the speed of the bus; for example, the 800MHz bus on a high-end Pentium 4 system serves up 6.4GB/sec of bandwidth, while the 2.2GHz bus of an Athlon 64 FX-51 delivers a whopping 17.6GB/sec. Don't confuse the speed of the memory bus with the speed of the memory itself, which may be faster or slower.

Chip-to-chip Interconnect: Every core logic chipset uses a "backside" bus to transmit data between various components on the motherboard—for instance, between the north and south bridges, or the PCI bus and the south bridge. Throughput on this bus depends on the interconnect technology in use; AMD's HyperTransport technology (found in nVidia's nForce2 chipset and several Athlon 64 chipsets) offers up to 12.8GB/sec.

AGP Bus: The AGP bus is your video card's private data pipe to the north bridge. The latest implementation (AGP 8x) offers 2.1GB/sec of throughput.

PCI Bus: All of your PCI expansion cards share the 133MB/sec of bandwidth delivered by the PCI bus. On some motherboards, integrated components such as a network chip are wired to dip into the PCI bandwidth pool as well.

Parallel ATA (IDE) Bus: Most of today's hard drives and optical drives operate on the parallel ATA bus. The latest ATA spec, ATA/133, boasts 133MB/sec of theoretical bandwidth on each channel, while the more common ATA/100 spec offers 100MB/sec.

Serial ATA Bus: Set to replace parallel ATA as the preferred data link between your hard drives and motherboard, the Serial ATA bus can transfer data at up to 150MB/sec per channel in its current iteration. Future generations of Serial ATA will deliver up to 300MB/sec.

Q: How are motherboards designed?

A: The process begins when a team of unwashed engineers hunkers down in a dimly-lit basement to brainstorm over the features they want in their next motherboard. Once they come up with a design, the engineers use CAD software to draw electrical schematics depicting where each and every component will be placed on the motherboard. Since not all the required circuitry can fit on just one board, modern mobos are designed in multiple interconnected layers. Complex calculations are performed to ensure that everything will play nicely together, and then logic verification software is used to double-check all the calculations.

After a tentative layout is created, the motherboard design is sent off to the manufacturing plant where a prototype is built. The completed prototype is sent back to the engineers, who then test it extensively to make sure it works. On the first attempt, it often doesn't, in which case the design is tweaked and sent back to the factory for another go. Once everything checks out, the motherboard is cleared for mass production!

Chapter Four

Cases & Formfactor Standards

The world of PC case design made quantum leaps in design, functionality, and size over the last year. But a massive architectural shift is on the horizon.

Whether you're into the sleek and futuristic aesthetic pictured above or a more traditional beige-box approach, choosing a PC case is one of the first aesthetically important decisions you'll make if you go the build-it-yourself route.

Like hundreds of cities, towns, and villages across the United States, in Los Angeles, you are judged by the type of car you drive. Sometimes the judging is done by the hot blonde in the Jaguar next to you at the stoplight; other times it's your friends when you drive to their place.

Like it or not, your car is a reflection of you. And we're not just talking make and/or model. We're talking cosmetic appearances—how clean it is, what kind of fabric your seats are made of, how much or how little you've customized it. Whether or not you have a custom license plate.

In this regard, the automobile and the PC case are similar. Both are made of metal and plastic, and can be colored brightly or mundanely. Both serve a vital containing function for a delicate, sophisticated, and expensive mechanical/electric apparatus. Both—at least these days—contain computers. Both are extensions of us, and, however shallow the reality, serve as an indicator of who and what we are. Both are an expression of our individuality, even if that individuality is frugal and conformist.

Behold, the CasEdge Diabolic Minotaur! Over the past 12 months, PC case design has begun to branch into more colorful shapes—and sizes.

By now, hopefully, you're getting the point. Much like the car industry evolved from "you can have any color you want, as long as its black" to the inner city–inspired craft of pimping out cars with dazzling colors, speed boosters, and other modifications. (MTV even aired a show in 2004 called, appropriately enough, *Pimp My Ride*.) PC case design is leaping from the boring confines of the beige box to an astonishing range of personality and style.

There are literally thousands of case designs made from all manner of materials—steel, aluminum, clear Plexiglas, even wood. The range of styles is equally impressive; you can buy PC cases that run the gamut from classy traditionalist all the way to anime-inspired, Transformer-esque designs. And, just like the automobile market, there are tens of thousands aftermarket case modifiers: lights, fans, mirrors, cooling devices, and all other manner of gadget-y doohickeys.

We're not even including the thousands upon thousands of exquisitely crafted custom case modifications by PC enthusiasts across the globe, like the PC made entirely from Legos you read about in Chapter 1, "Maximum PC: The Year in Review." Or the aquarium case mod that houses real fish. Or the PC stuffed into the wooden table. In fact, extreme custom case designs have become such a popular creative outlet that the whole branch of PC *modding* has spawned entire books and magazines, all devoted to the pursuit of building the ultimate custom enclosure.

We'll explore the concept of extreme case modding later in this chapter. (If you're particularly interested in case modding and design, keep your eyes open for *Maximum PC's Guide to Hardware Hacking*, which is on book shelves now.) For now though, let's explore some of the case design trends the *Maximum PC* Lab has witnessed over the course of the last 12 months, as well as what it all means for PC enthusiasts shopping for a new PC case enclosure.

"ONE OF THE BIGGEST TRENDS IN CASE DESIGN OVER THE LAST 12 MONTHS IS THAT PC ENCLOSURES ARE GETTING SMALLER AND SMALLER. THANK GOODNESS—TWO YEARS AGO, PCS WERE THE SIZE OF SERVERS!"

—GORDON MAH UNG, SENIOR EDITOR

SilverStone Nimiz

SilverStone is a high-end case manufacturer with the goal of building the absolute best cases in the industry, price be damned. A prime example of this philosophy is the company's warship-sounding Nimiz—an expensive case absolutely loaded with features.

The Nimiz's classy exterior provides a welcome reprieve from a market dominated by side windows, neon tubes, and laser lights.

The all-aluminum Nimiz is certainly pleasing to the eye. In a market dominated by bling, we're happy to see such elegance. The front bezel sports a dual-door design that uses tiny embedded magnets to keep the doors shut. The top door swings out to reveal six 5.25-inch drive bays. The lower door provides convenient access to the front fan filter and sports a push release cover for the bay of I/O ports. FireWire, dual USB 2.0, mic, and headphone jacks are all present and accounted for. Despite the case's overall sturdy construction, we admit to feeling slightly disappointed with the flimsy nature of the two case doors. Both rattled around on their hinges, and the weak magnets used to keep them closed consistently failed. When tipped to the front or side, the doors come loose and swing open, which makes transporting the Nimiz a nuisance. While full-tower cases like the Nimiz aren't designed to be transported, we'd still like to see more powerful magnets for the front doors.

SilverStone bucks the current side-window trend by going with a solid side panel, and maintains a clean, classy look as a result. The side panel is attached via three thumbscrews, allowing it to be easily removed along with the motherboard tray. Complementing the six 5.25-inch bays are six internal 3.5-inch bays, which is more than sufficient. Located on the case's rump is a power supply slot that accepts either a redundant power supply or a standard ATX unit. Interior cooling is achieved with 80mm fans mounted on the front and top; two optional rear 80mm fans bring the total up to four.

With its utmost accessibility, room for growth, and superb cooling system, the Nimiz is a power user's dream come true.

Originally reviewed, April 2004

SilverStone Nimiz

MAXIMUM PC VERDICT 9

CRISTAL

Excellent features, sturdy construction, tastefully appointed.

COOKS

Magnets that keep the front doors shut are too weak.

$285, www.silverstonetek.com

What to Look For in a Case

Whenever a *Maximum PC* staffer begins to contemplate building a new PC for home or testing use, we think long and hard about the following considerations. We know one thing for sure: Thinking about what you need in a case early on will save you a lot of headaches and indecision when it's time to make a buying decision.

- **What's the function of this PC going to be?** Are you looking to build a PC for your office, living room, bedroom, child's room? Knowing this will help you understand how big a case you want; after all, do you really want a gargantuan full-sized tower in your 11-year-old's room? Or do you want a loud, fan-heavy PC in your living room?
- **What kind/size of motherboard am I using?** This is less about compatibility and more about the importance of the mobo's feature set. If you buy a mobo with front-facing USB ports and FireWire in mind, make sure the case you're looking at has enough I/O ports in the right places.
- **What are my cooling needs?** If you're going to be running a power rig, you're going to need lots of active cooling—meaning fans. You should also think about airflow; your case should feature a blowhole on top and possibly on the side and should feature a wide-open design that encourages free circulation of air. Conversely, if you're building a more basic system, you needn't worry about extra cooling elements.
- **Will I be moving the PC a lot?** More and more often these days, PCs are frequently transported. With this in mind, pay attention to the doors on the case in question; do they flap open at the slightest motion? If so, this will prove to be a major annoyance during transportation.
- **How many drives will I be using?** Make sure you think forward in terms of your drive needs—both the hard and optical variety. If you're only thinking

about a single optical drive and a few hard drives, you can save space and money. But if you think there's even an outside chance you'll be upgrading your storage capacities in the form of a new hard drive or drive bay media reader, buy a case that accommodates them.

- **How often will I be upgrading my PC?** Aside from the space considerations this raises, accessibility is also a primary concern here. If you're going to build your PC once and have no upgrade plans, items such as a motherboard tray may not be necessary. However, if you're constantly tinkering with your PC, think about how accessible the add-in cards are, and how easy it is to access and remove your hard drives and optical drives.

When we test cases in the *Maximum PC* Lab, we always evaluate what kind of needs a case will best be suited for. We're a high-end magazine, so we tend to review PC case enclosures with our high-cooling needs, easy accessibility, and lots of expandability for multiple hard drives in mind. However, when we review small formfactor (SFF) boxes, we adjust our criteria; it's not fair to ding a case enclosure for not running cool enough if wasn't built with overclocking and power usage in mind.

Case-Testing Checklist

As with other PC parts and components, the *Maximum PC* Lab reviews its fair share of PC cases every year. Here's the checklist we use to evaluate cases. Use this the next time you go shopping—it could save you a substantial amount of regret.

- **Appearances**: What's our immediate gut reaction to the way this case looks? Does it look cheap? Sturdy? Aesthetic appeal is tough to gauge, but if a PC is going for a certain look, does it achieve that look or does it look like a cheap knock-off? One other concern that many consumers don't think about until it's too late: If your optical drives are beige or black, will these colors clash with the case's design? If they do clash, you're pretty much out of luck; while you could try painting them, it will likely result in your PC looking even cheaper.
- **Safety factor**: For metallic cases, are the edges rounded, or are there raw and exposed edges, which can be nearly as sharp as razor blades, that can cut us if we're not careful? When you're testing a few cases a month, all those nicks and scratches add up!
- **Moving parts**: If the case has moving parts, such as doors or bezel protectors, do they open and close smoothly, and do they stay closed? Also: Do these moving parts feel flimsy, like they'll break off, or sturdy and capable of withstanding constant use?
- **Space**: Is this case roomy enough to fit large cards into, or to perform upgrades and maintenance without feeling cramped? More importantly, can this case fit more than two drives? We're power users—we like to RAID our fastest two drives, and use a large capacity third drive to store our MP3s and videos.
- **Functionality**: How will our mobo fit into this case? Does it have the appropriate slots for all our mobo's ports—USB, FireWire, and otherwise?
- **Cooling**: How many fans does this case have? If it doesn't have many built-in fans, will we be able to insert more of our own? These days, we sneer at cases with only a single fan; how are we going to cool a P4 Extreme, three hard drives, and a GeForce 6800 with that?!
- **Accessibility**: How easy is it to access the innards to upgrade, clean, or fix our PC? Can we mount our motherboard easily? (Some case designs make set-up easy by providing a mobo tray that slides out.) Do the supporting struts make it harder to reach our RAM or certain sockets?
- **Sturdiness**: How much banging around is this case capable of withstanding, and is that worth the price? If the case uses an acrylic panel or panels, does that panel pop out easily, or does it flex *too* much?

Trend #1: More People Means More Case Personalities

Years ago, when aesthetically minded PC enthusiasts like ourselves would sit around talking about the future of our favorite technology/hobby, we'd wonder aloud why more people weren't into computers. "It's the cases," we'd always argue. "Mainstream consumers don't like ugly beige boxes. Once they can purchase PCs that aren't in beige boxes, everyone will own PCs."

Ironically, we were right about the last part of the argument, but our causality was inverted. Motivated by affordable prices and easier-to-use operating systems, the mainstream masses flocked to the PC in the late

1990s. Cases, for the most part, remained homely looking and plainly designed, although a few companies innovated by using black or even gray colors. This stood in stark contrast to the innovative design philosophy of the iMac, which was embraced by and responsible for energizing Apple Computers.

But as millions of people bought millions of PCs, a funny thing happened: Some of these users got hooked on the concept of building, upgrading, and tinkering with computers. Enter case design: If you're going to custom build your own PC, you're probably going to look past the boring beige (or black) box when you go to Frye's and reach for something a little cooler-looking.

As more and more people began to upgrade their PCs, the demand for more colorful designs increased. This need was filled by companies such as CoolerMaster, Antech, Silverstone, and scores of others. Consumers began to snatch up these companies' early designs, and the PC case boom was on.

Years later, the growing build-it-yourself trend shows no sign of abating. In fact, it's escalating. Over the last 12 months, we reviewed close to 50 different cases; no 2 were alike. During the same period of time, we probably heard about 10 times that number.

What's interesting is that as a wide variety of people from every possible age, racial, geographic, and socioeconomic background have begun to build their own PCs, their widely ranging aesthetic desires have resulted in a preponderance of different designs. At *Maximum PC* we're in favor of both these trends. Because we're enamored with PCs, the more people and types of people who get into them, the better, from our perspective.

Over the last 12 months, we've begun to notice an interesting phenomenon that is a result of this diversity: Cases are beginning to fall into several different categories. Here's a quick breakdown—if you're in the market for an off-the-shelf PC case, you should probably think long and hard about what type of

Chenbro PC6166 Gaming Bomb

We know what you're thinking: The Gaming Bomb pictured here looks cheap. This was our first impression too, but looks can be deceiving. Upon closer investigation, we found the Gaming Bomb to be surprisingly, er, bomb-like.

The Gaming Bomb possesses features you'd find in cases costing more than twice as much.

This mid-tower case's front bezel comes in four different colors (blue, green, silver, and orange) and is easily removed via two plastic tabs on the case's interior. Although the rest of the case is made of metal, the bezel itself is made of plastic and includes a perforated lower half with a soft filter on its interior. Perfect for sifting the air that enters the case from the front. Holes are drilled for 80mm or 92mm fans, but no fan is included. A well-stocked front I/O port is included as well, with two audio jacks, two USB 2.0 ports, and a FireWire port. Overall, the front of the case is well designed and packed with useful features.

The case's side panel includes a standard locking mechanism, and the door is released by shifting a single plastic tab upward. Operating the door is effortless, and we dig the subtle-yet-cool design. If you're into the currently popular clear look, the Gaming Bomb optionally comes configured with a transparent acrylic door.

The case's internals surprised and delighted us. The seven internal bays (four 5.25-inch, three 3.5-inch) are mounted with included plastic rails. Extra rails are kept secure in a holder on the floor of the case, and a cable caddy will help you keep your front I/O wires tidy. The Gaming Bomb uses an innovative screwless design for holding add-in cards in place; while it works fairly well, the plastic parts it uses feel flimsy. The case's rear includes mounting holes for a 92mm or 120mm fan, but again, no fan is included.

The Chenbro doesn't come with a power supply, but it costs just $45, for crying out loud! Considering its rock-bottom price, this low-cost case totally exceeds our expectations. It's not just a fantastic case for the money, but a fantastic case overall.

Originally reviewed, April 2004

Chenbro PC6166

MAXIMUM PC VERDICT 9

+ ALIEN QUADRILOGY

Screwless design, support for different size fans, useful front I/O port, affordable.

– ALIEN PROBE

Flimsy plastic arms on the screwless PCI card locks, no motherboard tray.

$45, www.chenbro.com.tw

look you consider most appealing. We've broken the various styles down into seven different categories:

- **The Classic**: This is your standard plastic-and-steel PC box. Plain-jane in color, design, and functionality, this type of case lacks doors and uses standard screws for its drive-bay slots and other apertures.
- **The Neo-classic**: This variant of the Classic also tends to emphasize function over form, but the Neo-Classic embraces a more jazzed up version of the traditional Classic design. Elegant, sleek, and simple, the Neo-Classic embraces brushed aluminum (or other solid, non-garish colors) cases with doors that cover the optical drive bezels. Silverstone's Nimiz is a great example of such a case.
- **The Bling**: This is the low-rider of PC case design. Featuring cycling lights, colored tubes and wire coils, and transparent case windows, the Bling takes the notion of a PC and "streets it up."
- **The First Person**: This design aesthetic can be best described as PC-as-animated-creature. Want a PC that looks like a Transformer? You're in this category.
- **The Neon**: This PC design tends to embrace transparent case walls; after all, if you're going to light up the inside of your PC like the Fourth of July, you probably want to make sure the light show can be seen from all angles.
- **The Demonic First Person**: Inspired by games such as *Quake* and *Doom 3*, this PC also embraces the PC-as-animated-creature notion, but adds a more evil touch. See the Minotaur case on page 55? That's demonic!
- **The Media Center**: If you want to build your computer for the living room—a growing trend—you probably want it to look more like a stereo component than a PC. You also probably want it to be small. We'll explore the small formfactor rig in detail later in this chapter.

"BTX IS A HUGE DEAL. IT'S GOING TO MAKE PC SYSTEMS MUCH COOLER, WHICH IS GOING TO MAKE THEM MUCH QUIETER. WHICH IS GOING TO MAKE THEM MUCH MORE CONVENIENT AND PREVALENT."

—WILL SMITH, TECHNICAL EDITOR

These days, PC cases are like cars: loaded with personality and suited to meet specific tastes and needs. These days, PCs can be a powerful statement about who we are and what we're like.

Trend #2: Prices Are Plummeting

If more and more are being released, it stands to reason that case prices are dropping, right? Right. While you can still purchase high-end PC cases for $200 or $300, you can find similar quality levels for half that price.

So what's the difference between a $300 case enclosure and a $150 one? Sometimes nothing but the name brand. This is why it's important to know what you're looking for, both in terms of style and functionality. With this said, we've typically found that more expensive cases tend to use more durable materials, are more solidly constructed, and feature more reliable (and powerful) power supply units. (Make sure you check out our case-testing checklist on page 57—it explains the key criteria our Lab uses when reviewing case enclosures.)

Over the last 12 months, we've been shocked to find PC cases that meet our rigorous needs for as little as $50. This is encouraging—the money you save on your case means you can buy a faster CPU or videocard!

Thermaltake Xaser III

The proliferation of fans—and their incessant humming—may be an abomination to some case aficionados, but for others, the whirring racket is just an integral part of hardcore hardware hacking. For these extreme upgraders, Thermaltake offers the Xaser III, which offers no fewer than *seven* 80mm fans.

The Xaser III takes cooling to new levels, with seven powerful fans.

There are two intake fans in the front to cool your hard drives, two intakes on the side to keep air moving across add-in cards, and two outward-blowing fans in the rear to vent hot air emanating from the CPU. The seventh chopper fits into a top blowhole just behind two USB ports, a FireWire port, and audio I/O jacks. The four intake fans are outfitted with washable filters to keep dust out—always a nice touch. And to top it all off, the Xaser III has an integrated baybus featuring four knobs for fan-speed adjustment (each knob controls two fans, which can be turned up or down in a continuous fashion). Via an integrated LCD display on the baybus, you can precisely monitor interior temperatures, and the system will even trip an alarm should the interior overheat. When the fans are turned all the way down, noise levels are comfortably low.

Construction is all aluminum except for a few minor plastic parts, and the side window is optional. There are four 5.25-inch and two 3.5-inch front accessible bays, as well as an additional six internal 3.5-inch bays. A familiar rail system is ready for drive mounting, and Thermaltake includes internal storage racks for unused rails, so they won't be misplaced. We also like the clever front door lock. Turn the key in one direction, and you lock the entire front. A second direction lets you swing only the bay door open. A third setting lets you swing open the entire front assembly to remove drives and change filters. There's also an intrusion switch that can warn you when someone tries to get to your rig's insides. This feature requires mobo and BIOS support, but once you have it activated, you'll know as soon as you boot whether someone's been messing with your PC.

With its silver-painted plastic parts and electroluminescent Thermaltake badge, you could argue that the Xaser III is downright tacky. But if you're into its looks, and fans are of utmost importance, this is your case. We would never call a $198 enclosure "low cost," but the Xaser III is a lot of case for the money.

Originally reviewed August, 2003

ION ENGINES: Solid construction, feature-laden, tons of fans.
SATURN ION: Design may appear tawdry to some, and it's got enough fans to drive Steve Jobs insane.

MAXIMUM PC VERDICT: 9

$198, www.thermaltake.com

Smaller Is Better

Two years ago, case designs were the Cadillacs of the 1970s; gargantuan, boxy, and roomy enough to lie down in. But once PC case manufacturers began to realize that only a small portion of consumers were actually using all that space, they started shrinking their designs a bit. Our lab is grateful for the shift—it saves the wear and tear on our backs and space in our Lab. Plus, who doesn't like nice, tidy-looking PCs?

What's interesting is that, even though case enclosures are getting smaller, most of the designs we see still meet most of our rigorous demands. We have noticed one consistent flaw in this new generation of small cases, however; they often are only built with two hard drives in mind. That's no good—the power PC user will often utilize three drives: one large capacity, slower-moving drive for mass storage and a two-drive RAID array that uses smaller capacity, but faster-moving drives.

Cooling Is King

One unwelcome evolutionary tendency the PC has exhibited over the last few years is a dramatic increase in the heat generated by individual PC components. As CPUs, videocards, and hard drives increase in speed, they generate more and more heat. This is a huge problem; heat is the leading cause of PC troubles such as spontaneous reboots, crashing, and locking up.

It's no surprise, then, that PC case design has evolved with increasing cooling in mind. Most enclosures these days automatically feature multiple fans, plus open spaces for extra fans. On top of this, we're seeing more *blow holes*—holes cut into the top or side of a PC to increase air circulation—in more run-of-the-mill PCs than ever before.

Still, though, power users are resorting to more extreme cooling conventions, like water cooling and refrigeration-based cooling. They know that if their

system is running hot now, it's only going to get hotter and hotter as we add new CPUs and new videocards.

Water cooling is interesting in that it is a completely quiet solution; mostly sold as after-market kits, water-cooled rigs use a pump to circulate water throughout a PC. In a nutshell, it works like this: Water moves through the PC, it makes "contact" via metallic conductors with component hot spots, such as CPUs and RAM. These conductors transfer the heat to the continuously moving water, which circulates the heat out of the case. The risk, of course, is that you have water in your system. A leaky rubber tube means disaster. Additionally, if your pump stops working unbeknownst to you, you have no cooling whatsoever, which can be catastrophic.

Refrigeration-based cooling is much more expensive than water cooling; in these schemes, a unit attached to the PC case generates ultra low temperatures.

As we enter 2005, it's clear that case cooling will become even more of a concern because CPUs, GPUs, and RAM will get increasingly hotter as they get faster. Enter the new BTX case spec, which is structured around drastically improving air flow in a way the current 10-year-old ATX case standard can't accomplish. We'll detail this promising new cooling scheme and case architecture on page 64.

Shhh! Quiet!

Seemingly in stark contrast to the increased need for cooling, PC owners more and more frequently want their systems to be quieter. After all, if you want to use your PC in the living room—or listen to music while using your PC in your office—the decibels thrown off by six fans can get a little annoying. To combat the effects of noise, case manufacturers are using quieter fans and noise-reducing foams in their designs.

Favorite Cases of All Time

As we looked back over the entirety of *Maximum PC*'s library of PC case reviews, we found ourselves marveling at the wide variety of top-notch enclosures we've seen over the past eight years. It definitely made choosing our three favorite cases tough. But we did it—feast your eyes on our picks for the top three cases of all time.

CoolerMaster ATC-201

Released back in the summer of 2001, CoolerMaster's ATC-201 immediately impressed us. We drooled over the case's classy-looking shiny aluminum exterior, which sported convenient USB ports on the front. We were even more impressed when we cracked the enclosure open and saw the extra roomy interior and top-notch case-cooling delivered via four fans. Internally and externally, the ATC-201 was way ahead of its time.

$250, CoolerMaster, www.coolermaster.com

Supermicro SC-750A

Nine fans, seven 5.25-inch drive bays, and three 3.5-inch drive bays made this full-size ATX tower an immediate winner in our eyes. Built with the true *Maximum PC*–style power user in mind, the SC-750A, released in 1999, allowed PC builders to go wild. This case featured so much internal space, we thought about moving into it. And we've yet to see such impressive cooling.

$200, Supermicro, www.supermicro.com

Shuttle XPC

Others came before it, but the moment Shuttle released its first small formfactor case, the world of PC building changed forever. We loved the case's simple elegance, and its versatility astounded us. Even more impressive was the system's stellar performance; the customized mobo (pre-mounted in the case) immediately proved itself worthy. Years later, countless PC designers would pursue the SFF standard; they have Shuttle to thank for cracking the market open.

$250, Shuttle, us.shuttle.com

Small Is the New Big

One of the more exciting developments in the realm of PC case design is the dramatic increase in the number of small formfactor PCs. Also known as SFF boxes, these tiny case enclosures offer the increased portability of laptops while retaining most of the power and expandability of desktop systems. For the most part, these

Startech Aluminator

Call us lazy, but we Americans love all things powered. Powered windows, powered seats, powered garage doors, powered armies of small, ferocious robot ants that will someday allow *Maximum PC* to conquer the entire world… In every aspect of our daily lives, we are able to avoid the slightest hint of physical exertion with a button and a motor. It is therefore no surprise to us that Startech thought to include a motorized door on its Aluminator case.

The Aluminator's motorized door is cool, but everything else about it yells *cheap*.

On paper, and from afar, the Aluminator appears to be a cool product. In addition to the motorized door, the case boasts a respectable laundry list of features. It has a backlit LCD that displays time, power, hard disk activity, and temperature. Four 5.25-inch and one 3.5-inch front-accessible bays, one floppy bay, and four internal 3.5-inch bays offer parking space aplenty for your drives.

Mountings for four case fans amply meet the cooling needs of all but the most insane overclockers, a decorated side window shows off the system's innards, and a front-mounted I/O cluster includes USB, FireWire, and audio connectors. The bundled power supply unit even boasts a decent 400-watt rating.

Sounds good, right? Unfortunately, this case doesn't stand up to closer inspection. You would think, from its name and its $240 list price, that the Aluminator is made entirely of aluminum. For the most part it is, but the entire front bezel is plastic—the cheap, silvery-gray plastic found on $20 boom boxes that doesn't appear metallic at all and produces an audible creaking when prodded.

Many aspects of the design, from the breakaway PCI slot covers to the flimsy plastic door hiding the front I/O ports, scream out Startech's cost-cutting measures. Furthermore, the LCD displays an inaccurate temperature reading for a few seconds after you switch between Celsius and Fahrenheit. None of these flaws are critical, but they are not the makings of a premium case.

Admittedly, or thankfully, the Aluminator's street price will probably be about $80 less than Startech's exorbitant suggested retail price. Nonetheless, with quality cases such as CoolerMaster's Wave Master selling for roughly the same price, you should ask yourself how badly you want a motorized door before shelling out the dough for this case.

Originally reviewed, January 2004

MAXIMUM PC VERDICT 6

LEXUS
Motorized door, ample internal room, power supply included.

YUGO
Tacky construction, overpriced.

systems come pre-equipped with special motherboards, but can accept standard components—videocards, optical drives, and hard drives. (This isn't always the case, though; irregularly shaped components often create tight squeezes or require "alteration.")

Shuttle Computer (us.shuttle.com) is typically credited with being the innovator of this emerging trend. For PC users looking to build a system in their living room, or one they can transport to LAN parties, the company's stylish-looking cases provide a welcome alternative to full-sized desktop enclosures.

Recognizing the trend, numerous case manufacturers have jumped into the market. In 2004, we reviewed close to 20 different SFF boxes, and that was a small slice of the SFF pie!

Custom Modding Is Still Influential

One of the single biggest influencing factors for off-the-shelf case design has been the custom modding scene. Years ago, custom case modding was marginalized as freakish and over-the-top. But over the last few years, more and more PC enthusiasts are finding themselves enthralled with the aggressively creative designs this community has come up with.

We'd like to think that, in some small way, *Maximum PC* has helped shine the spotlight on this genre of case design—our "Rig of the Month" back page has been one of the most popular sections of the magazine for the last few years.

What's really interesting is that, as custom case modding has become more popular, conventional case design companies have found themselves borrowing elements and aspects of these creative designs and incorporating them into mainstream boxes. It is clear that this scene has been the inspiration for enclosures that look like robots, or cases that boast LCD screens on the front panel.

With this in mind, it would be easy to argue that if you *really* want to know what the upcoming trends are in PC case design, you should look to the most extreme case designers of all.

Our Favorite Rigs of the Month

Combining creativity, ingenuity, and engineering, these were our three favorite Rigs of the Month of the last 12 months

November 2003: Russ Caslis's "Millenium Falcon"

Say what you will about *Star Wars* fans, they sure find some inventive ways to pay tribute to their favorite franchise. Russ Caslis paid his respects with a fully functional computer that was painstakingly stuffed into a small-scale model of Han Solo's famed freighter. Caslis was familiar with said model, having owned one as a child. "Many hours were spent simply looking at the toy," Caslis told us, "trying to figure out how to fit everything inside, and where all the connections would be."

October 2003: Scott Clark's "Industrial Revolution"

We loved this Rig of the Month because it combined old-school analog engineering with PC modernity. We also loved this entry because all the cool-looking dials and knobs and display devices on Scott Clark's rig really worked. These doo-dads controlled the elaborate water-cooling system that kept the 1GHz AMD proc overclocked to 1.43GHz. A vintage elapsed-time meter even displayed the total number of hours the PC had been turned on.

March 2004: Barney Lascola's "Come Fly with Me"

The simple wooden elegance of this mod made it an easy Rig of the Month winner in our March '04 issue. Barney Lascola explicitly designed this desk PC to combat his two pet peeves, wires and noise. The former he eliminated by routing all cables through a hollowed-out leg of the desk; a Koolance water-block takes care of the latter by keeping noisy fans to a minimum. The PC itself rested in plain sight beneath the bronze-tinted glass desktop. A second power supply illuminated the PC's works even when it wasn't on.

Looking Ahead: Case Design

While BTX is the future of formfactors, we expect small formfactor (SFF) cases like this one to become more prevalent in everyday PC life; their unconventional appearance and petite size make them extremely handy and quite versatile.

We looked into our crystal ball and saw major change on the case design horizon. Can you say *BTX*?

Here's a tough question for you. Look at your PC and contemplate which component, besides the mouse and keyboard, would remain useful after eight years. The CPU? Hardly. RAM? No way. Videocard? Impossible.

There's actually only one part that could still be kicking around after nearly 10 years: the ATX case, a standard for case and mobo design that has rapidly become increasingly outdated due to the increasing amounts of heat that modern PC components generate. That's about to change. This year, we'll see the first systems using the new BTX formfactor.

This doesn't mean that the ATX case standard will be replaced overnight; it will take a few years for BTX to slowly take over. Why make a new formfactor for desktop cases when the current approach seems to work fine? Because the Advanced Technology eXtended (ATX) formfactor was designed for 1996 PC technology. To give you an idea of how ancient the design is, ATX was originally supposed to suck air in through the power supply and blow it over the CPU to keep it cool, an idea that's long since fallen by the wayside. In contrast, BTX is designed to meet the thermal requirements of tomorrow's CPUs and videocards.

The immediate difference you'll see on a tower case is the reverse mounting of the motherboard. In

Other Future Case Design Improvements

BTX is definitely the big change coming, but because it will take a few years to become firmly established, we still anticipate seeing further development in the following categories:

- **Small formfactor boxes**: More will be released as more and more PC enthusiasts migrate toward building PCs for nontraditional reasons—media centers, portable digital jukeboxes, and LAN party boxes.
- **Stereo component-looking cases**: It appears that the PC is destined to migrate into the living room. With this in mind, we'll see more and more cases designed to look like traditional stereo components.
- **More radical cooling schemes**: In our June issue, we detailed a company named Nanocoolers that was working on an even more extreme cooling system than water. By using liquid metal and an electromagnetic pump, this company claimed it would eventually revolutionize PC cooling by making it smaller, easier to install, and less risky. Time will tell, but it's clear that, even with the BTX shift due, cooling will remain a high priority.

most BTX towers, you'll have to pop open the right side instead of the left to access the interior. BTX also makes a major change with the CPU placement. In ATX cases, the CPU is positioned just under the power supply. In the BTX design, the processor resides in the middle-front of the case—an area the ATX case typically reserves for hard drives. This way a fan can suck cool air from outside the case and blow it directly over the CPU first. This is a big shift; in an ATX case, cool air is usually pulled in from the front and gets heated by other components before even reaching the CPU. Airflow in a BTX case will be routed in from the front, come over the CPU, and then over the chipset, RAM, and voltage regulators for improved flow patterns.

BTX will also call for a new power supply with a 24-pin connector. While the BTX spec will be released later this year, it will take several years for it to completely supplant ATX. So don't sweat it if you just bought a $200 aluminum ATX case.

Tips for a Quieter PC

There are three major approaches to quieting your PC: water cooling, component replacement, and soundproofing. Each has its inherent advantages and disadvantages, and in the end, you'll probably find that the ideal strategy involves a combination of two or even all three of these methods. Here's a selection of our best noise-reducing tips:

Water Cooling

The most extreme approach to quiet cooling also happens to be the most effective. Water cooling starts with metal "heat blocks" that are attached to the hottest components in your system. Each block attaches to a component on one side and plastic tubing on the other side. The tubing runs to a central radiator. Cool air is pumped from the radiator through the tubes and to the heat blocks, where it absorbs the heat and heads back to the radiator, where the heat gets dissipated. But water cooling isn't for everyone; it's expensive (in excess of $300), difficult to install, and risky.

Component Replacement

Replacing noisy components in your system with quieter ones is an effective approach. A number of companies make quiet CPU coolers, case fans, and power supplies. As an example, Zalman's CNPS7000-Cu is a heatsink/fan combo cooling unit that supports Intel and AMD CPUs, and Enermax's UAC-12FAB 120mm fan generates a whole lot of air with minimal noise. Additionally, many hard drives now use fluid bearing motors for reduced noise. The quietest all-round optical drive (a notoriously screechy component) we've found: Samsung's SM-332 combo 32x CD-RW and DVD-ROM.

One easy way to quickly and cheaply reduce the noise your rig emits is to use noise-absorbing materials like Dynamat or Magic Fleece. You have to be careful, though; these materials can significantly increase your case's temperatures.

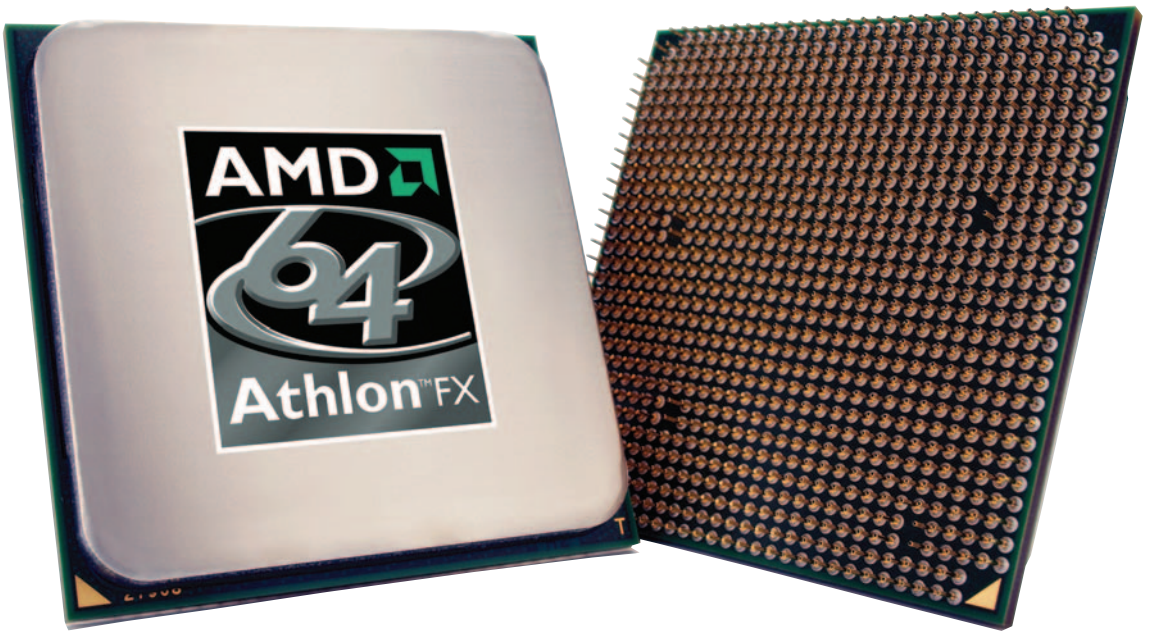
Soundproofing

This approach involves placing sound-deadening materials and insulation inside your case to absorb the noise generated by your fans and other moving parts. It's fairly effective and inexpensive (around $50 to $100), but if applied willy-nilly, soundproofing can lead to dangerous case temperature increases. Sound-deadening materials we've tested include Dynamat, Magic Fleece, and AcoustiPak. We found Dynamat to work the most effectively; it does a great job of absorbing noise, and doesn't result in too big a heat increase.

Chapter Five

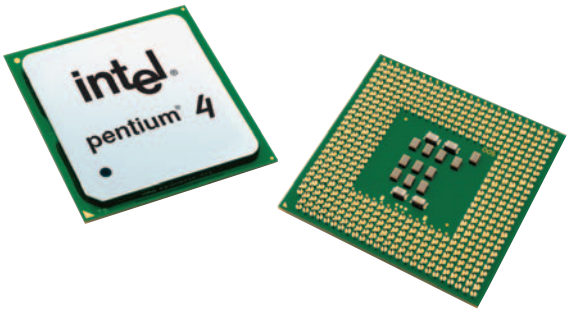
Processors

AMD and Intel continued their epic battle, but this time with surprising results.



AMD made big news with the release of its Pentium 4 killer. The Athlon 64 FX-51 was the first 64-bit CPU released for consumers' desktop PCs, and allowed AMD to mount a major attack on Intel's industry-leading reputation.

Unequivocally and without a doubt, the CPU is the most important—and most exciting—decision you'll make when you build, upgrade, or purchase your PC. And it should be—it's often among the most expensive components. And this decision definitely has the potential to have the greatest impact upon your CPU's day-to-day performance.



As we entered the summer of 2003, Intel dominated the CPU market with the Pentium 4.

One thing you may not know about *Maximum PC* is that we do not "review" CPUs. Not in the typical fashion, at least. We write about them a lot—and often in a very opinionated fashion—but we never assign review scores (known as verdicts) to processors. Why? One reason is that we can't possibly review every single clock speed iteration of every single CPU released; the updates come so quickly it's impossible to keep up with them. The other major reason is that "verdictizing" CPUs would create crazy continuity problems. Imagine trying to use our magazine to buy a CPU; you'd see a wide number of CPUs, some old and some new, and most of them would receive high scores. That's no help if you're in the market for a new CPU!

For many years now, choosing a CPU has meant choosing between two companies: Intel and AMD. Also for a long time, both companies' reputations remained fixed. Intel was like Levi Jeans; they cost a great deal more than AMD's CPUs but the perception was that Intel's processors were more stable. AMD, on the other hand, was like the Gap of CPU design; the company's CPUs were much more affordable, but were perceived as being not as reliable.

These images changed in a major way over the course of the last year. In particular, 2003 was a *huge* year for AMD. And we're not talking normal huge. We're talking massively, earth-breaking huge. After years of chasing Intel's design and technology, the smaller CPU manufacturer that could finally caught up with Intel, and even surpassed the two-ton gorilla at the high end of the processor market.

AMD's late summer release of the 64-bit Athlon 64 CPUs—the Athlon 64 3200+ and the Athlon 64 FX-51—shocked the hardware world in the fall of 2003. The shockwaves were felt worldwide as consumers began to snap up the new CPUs, and AMD's reputation rapidly changed from copycat to innovator. Intel, a company accustomed to leading the market and consumers, suddenly found itself on the defensive, fighting off the perception that it had been out-engineered by the same company that used to license its technology.

By May 2004, the ramifications of this turnabout were clear; Intel announced a radical, sweeping change of plans, including the shocking decision to kill off much of its next-generation Pentium 4 designs.

This chapter explains how such a major shift occurred, and takes an up-close and personal look at both companies' CPU designs for the last 12 months.

Summer 2003: Pentium 4 Domination

Heading into the summer of 2003, Intel's Pentium 4 was clearly the dominant CPU on the market. Released in late 2000, the CPU's four-year run sustained the claim we made way back in the November 2000 issue that the proc had "incredibly long, long legs." (As an aside, we expect to see the P4 architecture someday hit clock speeds of 5GHz and beyond.)

By mid-summer 2003, the Pentium 4 had been released in a new "C" model that boasted a top clock speed of 3.2GHz and an astonishingly fast 800MHz bus speed. This CPU showed no signs of slowing down; our Lab testing consistently found it faster than AMD's Athlons. In fact, in Lab tests, we consistently found it to be considerably faster than AMD's P4 equivalent, the Athlon XP.

"INTEL SUDDENLY FOUND ITSELF ON THE DEFENSIVE, FIGHTING OFF THE PERCEPTION THAT IT HAD BEEN OUT-ENGINEERED."

Pentium 4: Up Close

The Pentium 4A, the original "Northwood" Pentium 4, boasted 512KB of cache that ran on a 400MHz bus and used a 0.13-micron core. The P4B is the Northwood running on a 533MHz bus. (The newer P4C uses an 800MHz bus.)

Although it was released way back in 2001, the P4 architecture has a lot of headroom left in terms of performance. It's expected to reach 5GHz and beyond! The P4 is unique in its support for Hyper-Threading—which essentially splits a single physical CPU into two virtual CPUs and allows improved multitasking. Introduced in late 2003, this awesome new technology allows one virtual CPU to run floating point operations while the other virtual CPU uses the P4's other resources to perform other functions. Hyper-Threading is only available on the 3.06GHz Pentium 4 and the newer 800MHz bus Pentium 4 CPUs.

Ah—the Pentium 4. One of our favorite CPUs of all time, the P4 ushered in a powerful new age of personal computing that cemented Intel's dominance of the CPU market for three years.

Intel's flagchip began life at "low" clock speeds of 1.5GHz with only 256KB of L2 cache and running on a 400MHz bus. The 0.18-micron CPU was beat down almost daily by AMD's Athlon processor—until Intel moved the chip to a 0.13-micron process and upped the cache to 512KB. As late as the summer of 2003, it appeared that Intel's vision had played out successfully; its clear superiority over the Athlon XP had shut the mouths of all Intel haters.

While the Pentium 4's dominance changed with AMD's release of its two 64-bit CPUs, the Athlon 64 3200+ and the Athlon 64 FX-51, the P4 remains one of the best-selling CPUs today. As of this writing, the fastest Pentium 4 was the 3.4GHz version.

One of the P4's biggest features was its support for Hyper-Threading, which was introduced into the Pentium 4 line in late 2002. Hyper-Threading is important because a good portion of a CPU's resources aren't used all the time; for example, while it performs calculations using the floating point unit, other portions sit idle. Hyper-Threading essentially splits a single physical CPU into two virtual CPUs. While one application is running floating point operations, another can use the other resources of the CPU. This is a huge boon to people who run multiple applications simultaneously. Although there are occasions when a CPU will run slower because two floating point-heavy applications are trying to vie for the same physical resources, Hyper-Threading is generally recognized to be a performance booster, especially for multitaskers.

One other advantage the P4 boasted over its AMD's competition: It was eminently overclockable. Upon the P4C's release, Internet reports indicated that you could achieve nearly a 1GHz overclock with this CPU and the right mobo.

Ultimately, however, Intel's superiority with the Pentium M only served to underscore the magnitude of the massive shock generated by AMD, the company's arch-nemesis, in late September.

Pentium M

Intel further fortified its CPU lineup with the Pentium M, also known by its Centrino badge. Interestingly, the Centrino badge does not denote a processor or chipset, but rather certain specifications a laptop must include to earn the moniker: an Intel Pentium M proc, Intel's 855PM or 855GM chipsets, and Intel PRO/Wireless 2100 (or future versions).

Designed from scratch by Intel to avoid the limitations of its previous mobile processors, this speedy new CPU quickly won the hearts of the *Maximum PC* staff. The chip's low power consumption meant low battery consumption in notebook PCs. And even better, the proc's efficient design allowed it to crunch unbelievable amounts of data despite a relatively slow clock cycle. Because of these efficiencies, the Pentium 4 also emits much less heat than most other CPUs on the market today.

Intel has been so enamored with the Pentium M's speedy, efficient design that the company decided to forgo much of its future Pentium 4 development in favor of implementing dual- and multiple-core Pentium M CPUs. This means that, in a few years' time, we'll be computing with CPUs that actually consist of two or more CPU cores! For more information on this, turn to the "Looking Ahead" section on page 78.

Last year, the 1.7GHz version of this CPU took laptops by storm; every high-end portable we reviewed seemed to feature the Pentium 4M.

AMD Leaps into the 64-bit Market

On September 23, 2003, AMD dropped the 64-bit consumer bomb on the consumer processor market. Prior to this point, we had publicly marveled at the new CPU's potential, but until we actually got the Athlon 64 and the Athlon 64 FX-51, who could be sure that these two new next-gen procs would actually deliver the goods like AMD had promised?

Thankfully, our sources at AMD hooked us up; we received one of each CPU a few weeks prior to their public launch. We were blown away—AMD had actually accomplished what had been unthinkable in 2002: The company had out-engineered Intel and released a consumer-oriented desktop processor well in advance of its arch nemesis.

Running at 2GHz and boasting a single-channel DDR memory controller integrated into its core, the Athlon 64 3200+ was AMD's "standard" 64-bit CPU, and would eventually replace the Athlon XP. Running at 2.2GHz and boasting a *dual*-channel integrated memory controller, the FX-51 was aimed squarely at *Maximum PC* readers—PC enthusiasts, gamers, video-editing buffs, and backroom benchmarkers. One of the downsides to the FX-51's stellar performance was that it required the use of tough-to-find "registered" memory. Previously only required by some high-end workstations and servers, registered memory includes an extra chip, which buffers and re-times critical signals to allow reliable operation with DIMMs that have more than the typical limit of 16 or 18 chips. Incidentally, the "51" moniker was meaningless—AMD said that it intentionally picked a new naming convention that bore no specific meaning. The Athlon 64 plugged into Socket 754, and the FX-51 used Socket 940.

Besides on-die memory controllers, which provide noticeable benefits in 3D gaming, both chips featured 1MB of Level 2 cache and support for Intel's SSE2 instructions.

CPU Shootout: Intel vs. AMD vs. Apple

In our December 2003 issue, we created a monster CPU matchup, pitting the Pentium 4 Extreme Edition against the Athlon 64 FX-51. And, just for good measure, we also included the processor for Apple's new G5 system, IBM's PowerPC 970 chip, in a dual-CPU setup. After weeks of testing, this was our conclusion:

Judging the CPUs on pure overall performance, we declare Intel's Pentium 4 Extreme Edition the winner by a razor's edge. Its large L3 cache seems to give the old P4 a big boost in many multimedia applications and makes it very competitive with the Athlon 64 FX for gaming. Hyper-Threading is also becoming of great value and is responsible for some of the performance boosts here.

However, the Athlon 64 FX ran a close second and was very competitive with the Pentium 4 Extreme Edition as the best PC CPU. Its on-die memory controller makes it the best overall performer for gaming applications. The Athlon 64 FX also shows its prowess in floating-point-heavy applications (read scientific) where it eye-gouges the Pentium 4 Extreme Edition and kicks the G5 in the nads.

The G5 is firmly in third place but things are actually looking very good for Apple. While previous "benchmarketing" stories from Apple surprisingly didn't get the company sued for false advertising, the G5 is a wonderful performer with code that supports Altivec and both CPUs. For heavily multi-threaded tasks, we're comfortable saying the G5 will likely pull ahead of single-processor PC systems. However, the real issue is the existing code base that isn't optimized for dual processor use or Altivec (a high performance vector processing expansion to the PowerPC architecture that Apple has incorporated into its G4 computers). With those applications, the G5's performance is a travesty to computing. We'd even bet that in some applications, the G5 will be no faster or even slower than the G4. We saw a similar problem when the Pentium 4 was introduced. Although clocked one-third higher then the Pentium III, in many applications, the Pentium 4 was *slower* because of the code. It's taken almost three years for the code to catch up and make the P4 a screamer. Apple users face the same problem. Still, we'd be showing our bias if we didn't give the Mac a nod—it's finally a worthy competitor that gives Mac users performance they've never had nor experienced before. It's like indoor plumbing, the rule of law, and penicillin being introduced to a third-world nation.

The big question is whether Apple can keep it up. How long will it take Apple to adopt DDR2 or PCI-Express and Serial ATA 2 when they're introduced next year? And how will the G5 compare to the Prescott and Socket 939 version of the Athlon 64 FX? Only time will tell but for the first time ever, we're happy to report that Apple's claims aren't the usual bs. The new Macs are fast and if the PC doesn't keep moving, it could actuallyv fall behind.

Originally published December 2003

This had previously been exclusive to Intel CPUs. The chips' memory controllers, L2 cache, and SSE2 instructions all provided a substantial performance boost in our benchmarking tests.

More impressively, however, the processor could digest both 32-bit and 64-bit code, with no performance-bogging emulation required. "It is a Pentium 4 killer by any other name," we exclaimed. The 64-bit hook was exciting because it allowed an element of future-proofing for the new CPU. However, we remarked at the time that users wouldn't be able to play 64-bit games or use 64-bit applications until Windows released the 64-bit version of Windows XP. Unless, that is, they wanted to use the 64-bit version of Linux.

The biggest difference in these two new processors, however, was the unrivaled performance the 3400+ and the FX-51 exhibited in our Lab. In both floating-point intensive and gaming-oriented benchmark tests, both CPUs were screaming fast.

The timing couldn't have been better for AMD. After Intel's major success with the Pentium 4, AMD desperately needed a success, for business and image purposes. They got one with the Athlon 64 3200+ and the FX-51. Consumers, attracted by the new CPU's forward-thinking 64-bit architecture, started snapping the affordable CPU up. And system manufacturers, always ready to cash in on consumer demand, starting building PCs based on the new chips.

Did Intel Possess Hidden 64-bit Code?

AMD's 64-bit gambit set off rampant speculation around Intel's 64-bit plans. Rumors began circulating around the Internet that Intel's upcoming CPU, code-named Prescott, would actually contain dormant 64-bit extensions in the form of a clone of the AMD64 architecture that Intel could turn on at will.

Intel denied the claims, but six months later, these rumors turned out to be true. The leading chipmaker in the world would ultimately reverse engineer AMD's 64-bit instructions.

CPU Shootout: AMD Athlon 64 FX-51 vs. Pentium 4

It may be years before you see any benefit from the 64-bit capabilities of the Athlon 64 FX, but in the here and now, the chip is one fast mutha—and the new king of the desktop hill.

The Athlon 64 FX spanked the Pentium 4 in almost all of our Lab's benchmark tests.

To test AMD's would-be golden boy, we directly compared it with similarly configured Pentium 4. Both systems were outfitted with the same ATI Radeon 9800 Pro videocard, and each used a 120GB Western Digital WD1200JB hard drive and Windows XP Pro with SP1. Our P4 ran at its current-fastest clock frequency of 3.2GHz; we didn't clock it down to the FX-51's speed of 2.2GHz in order to attempt a more "apples-to-apples" comparison. The fact of the matter is that Intel and AMD each have a different strategy to achieve higher performance; Intel opts to let sheer clock speed muscle its way through benchmarks, while AMD eschews raw clock speed in favor of a more efficient design.

And the Results Are…

Given that the FX-51 was hobbled by a 1GHz clock-speed handicap, we can only conclude that the AMD64 architecture is otherworldly efficient, because AMD won most of the important benchmark battles. Consider: In every gaming-related test we ran, the Athlon 64 FX-51 finished first. It simply schooled the P4C in 3D games. One can only surmise that the integrated memory controller and extra L2 cache come in huge and handy here.

Not everything was sour for the P4, though. Intel's clock-speed advantage proved essential in a host of tests. One can only surmise that the P4 does well with code that requires a lot of predictable, repetitive computations—like media-encoding.

Our conclusion is this: The Athlon 64 FX-51 is a compelling product; it's the new processor of choice for any current games, and probably any games on the horizon. It's also the leader of the pack in older apps that are floating-point-intensive. In fact, just about any app that favored the Athlon XP now runs even faster on the Athlon 64 FX. All hail the Athlon 64FX!!

Pentium 4 Extreme Edition Is Released

64-bit controversy aside, Intel released a super high-powered CPU of its own in November in a bid to reclaim performance ground lost to AMD's Athlon 64 FX CPU. The company's new CPU was named the Pentium 4 Extreme Edition, and Intel trumpeted the fact that this proc was designed for gamers and for PC enthusiasts. The P4EE's innards were astounding; an 800MHz bus speed was supplemented by a Level 3 cache bigger than anything we'd ever seen. Weighing in at a gargantuan 2MB, the Extreme Edition's L3 cache allowed the CPU to preload tons of data, thereby drastically improving performance in most of our Lab's benchmarks.

The processor was initially released at a clock speed of 3.2GHz, and is compatible with the existing Intel 865 and 875 mobo chipsets.

While the release of the P4EE allowed Intel to once again run neck-and-neck with AMD's FX-51 proc, critics rarely failed to mention the lack of 64-bit support in the new CPU. But, while it was clear that 64-bit code would be omnipresent five years in the future, very few applications were available that utilized 64-bit code at the time. In fact, even today, you can count the number of apps optimized for 64-bit instructions on one hand.

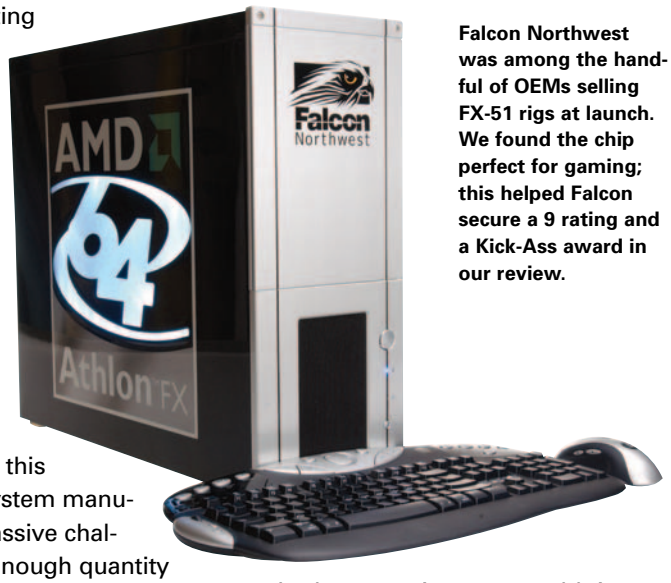
And, as of the writing of this book, Microsoft still hadn't released the 64-bit version of Windows XP.

The biggest problem facing Intel around the P4EE was availability; it was nearly impossible for consumers to get their hands on this new CPU! Even system manufacturers faced massive challenges obtaining enough quantity of the processor to sell systems based on it.

The final barrier confronting PC enthusiasts looking to amplify their system performance by upgrading their proc was price. The price tag of $1,000 per CPU put it out of reach of almost all PC upgraders and builders.

Our take on the new chip was that while it delivered impressive performance, the Pentium 4 Extreme Edition still indicated that Intel had been out-engineered by AMD. The sentiment in the *Maximum PC* Lab almost made it sound like Intel had cheated by placing such a massive L3 cache in the P4EE.

Still though, speed talks, and this new CPU allowed Intel to retain most of its credibility with the gaming and PC enthusiast crowds.



Falcon Northwest was among the handful of OEMs selling FX-51 rigs at launch. We found the chip perfect for gaming; this helped Falcon secure a 9 rating and a Kick-Ass award in our review.

In the meantime, we couldn't wait to get our hands on Intel's newest CPU, Prescott.

Along Came Prescott

Finally, in January, the moment we'd been awaiting for arrived. Intel released its newest CPU, the Pentium 4 Prescott. We were so excited about the new proc that we loudly trumpeted our hands-on evaluation of it on the cover of our March issue. But we couldn't help but wonder: Why was Intel downplaying the release of a CPU that could have easily warranted a Pentium 5 label? After all, the Prescott represented a drastic departure from existing P4 architecture, boasting a new fabrication process and a much longer pipeline.

Was Intel scared of hurting sales of its existing Pentium 4 lineup by launching a brand new product line? Or perhaps the company was worried that, when measured against the Pentium 4 Extreme Edition in today's tests, Prescott would suffer in comparison, thereby damaging the Pentium 5 name.

"INITIALLY, WE WERE PUZZLED; INTEL DOWNPLAYED THE MUCH ANTICIPATED RELEASE OF A CPU [THE P4 PRESCOTT] THAT COULD HAVE EASILY WARRANTED A PENTIUM 5 LABEL."

—GORDON MAH UNG, SENIOR EDITOR

Regardless, Prescott featured some remarkable architectural advances that represented a massive leap forward for CPU technology: a much longer pipeline, new instructions, and a smaller fabrication process. As a CPU core, Prescott had changed significantly from the Northwood—much more so than the jump from the original Willamette P4 to the Northwood architecture.

The really big news with Prescott was the shift from the 0.13-micron (or 130 nanometer) process Intel had used in constructing the Pentium 4 since the second-generation Northwood version to a new 90 nanometer process. This new process gave Intel a few advantages besides the ability to cram more transistors into a smaller space.

(Anytime you shrink the size of the circuits in a CPU, you also shrink the distance electrons must travel to get from point A to point B. Consequently, less voltage is used, which creates less heat. This means the CPU can run at higher clock frequencies.)

Intel's original 1.5GHz Pentium 4, code-named Willamette, ran hot because it used a 180 nanometer process. As a result, the CPU didn't overclock very well and ran out of gas at 2GHz. Shrinking the die to 130 nanometers allowed Intel run the Northwood all the way from 2GHz to 3.4GHz with no end in sight. We felt that shrinking the die to 90nm would greatly benefit Intel's—and perhaps consumers'—bottom lines as it would theoretically reduce production costs by quite a bit.

As we explored the P4 Prescott further, we discovered that, beyond the die shrinkage, Intel had tinkered quite a bit with Prescott's actual core. The

CPU Dies: Up Close & Personal

Let's take a circuit-level look at this year's important CPU releases, and explore why die size is so damn important.

When you hear the term *die size* in reference to a CPU, this refers to the CPU's physical surface area size on the silicon wafer it originates from. Die size is typically measured in square millimeters (mm^2). You can think of the "die" as the shape or form of a processor.

The primary reason die size has become important is economic. The smaller the die size, the more that can be made from a single wafer. This means greater financial efficiency for the chipmaker, and can theoretically lead to lower prices for the consumer. Conversely, a larger die means fewer chips can be made, which reduces the economic efficiencies and can lead to higher prices.

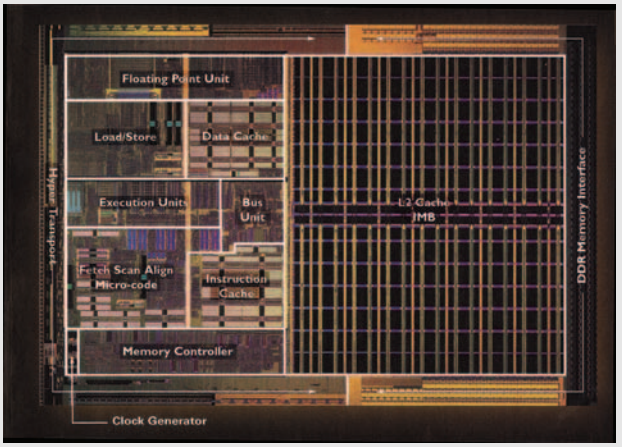
Die size can also affect power consumption; larger dies typically result in increased power consumption.

A few different factors contribute to die size. The first is the design of the processor. A large design—many new CPUs are much larger than their predecessors because of increased functionality—will obviously result in a larger die size. Similarly, the size of the circuits themselves also make a difference.

The fabrication process a chipmaker uses matters more than anything else, however. Usually measured in nanometers (one nanometer is one billionth of a meter), the fabrication process technology used to build CPUs can make a drastic difference in die size. A smaller fab process means increased economic efficiency, and can translate into faster performance. Intel's Pentium 4 Prescott CPU, for example, is the first to be built on a 90nm process, which is incredibly efficient. To get a sense of how tiny the 90nm process is compared with the Pentium 4's current 130nm process, note that Prescott has more than twice the number of transistors than the current Northwood Pentium 4, yet is $33mm^2$ smaller. To imagine the size we're talking about, consider this: A nanometer is only 3 to 5 atoms wide, and the period at the end of this sentence is 250,000 nanometers across.

Not surprisingly, as time goes on, process technology continues to shrink in size.

Inside the Athlon 64 FX



Here's a circuit-level look at the die that's currently used for the Athlon 64 FX. This die is also used for AMD's 64-bit Opteron server chip. What's new and different here, you ask? Read on to find out.

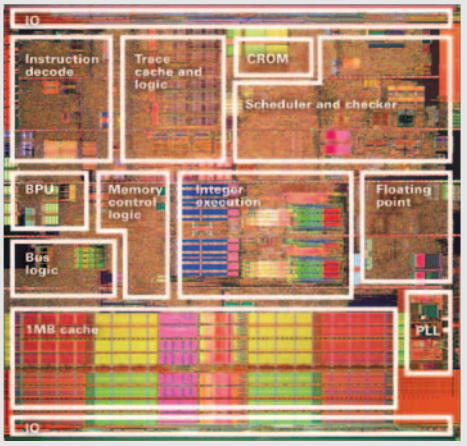
No major architectural changes

In respect to 32-bit software, there's no magic to the Athlon 64 FX's K8 architecture. In fact, it's very similar to the design of the K7 core found in the Athlon XP. Some major features—including out-of-order execution, the translation of variable-length x86 instructions into fixed-length RISC ops (ROPs), and the ability to decode up to three x86 instructions and issue up to nine ROPs per clock cycle—are identical between the new and old cores.

Extended pipeline

The FX series's pipeline is a little longer than Athlon XP's K7 core, and includes one extra cycle in the instruction-decode sequence, as well as one more for integer math. These additions relieve constrictions in the K7 design, allowing the K8 to run a little faster in the same 130nm process. However, the 12-stage effective length of the K8 integer pipeline is still much shorter than the Prescott's huge 31-stage pipe.

Inside the Pentium 4 Prescott



Here's a close-up look at the Pentium 4 Prescott's die. Amazingly, this CPU features more than twice the number of transistors than the Northwood CPU, and is smaller.

Increased cache

Prescott still retains the 12KB trace cache of the original Pentium 4 but increases the L1 data cache to 16KB from 8KB. Unlike older CPU designs, such as the Pentium III, the P4 series can store up to 12KB of simple instructions that have been decoded from x86 instructions into what Intel calls micro-ops.

Improved process

Prescott features a seven-layer vertical process vs. Northwood's six layers, which helps reduce the transistor density on the core and reduce the wire delay, or latency of signals moving through the core. Think of a layer as a floor in a building; more vertical layers saves horizontal space.

Other enhancements

Other major enhancements in Prescott include 12 additional stores over the P4 Northwood's 24 for faster data processing, an improved branch predictor that will speed up productivity applications, and two more write combining buffers, which should help reduce bus traffic.

AMD CPU Shootout: Athlon 64 3400+ vs. FX-53

How much faster is AMD's top-of-the-line CPU?

We already know the Athlon FX-53 is fast, but exactly how much of a performance boost does its dual-channel RAM give you over a plain-Jane Athlon 64? To find out, we took an Athlon 64 3400+ (the fastest available) and compared it with an Athlon 64 FX-53. And because we were curious, we also compared it with an Athlon 64 FX-51.

If you haven't been following current CPU events, we should say that you can't use an Athlon 64 in a motherboard designed for the Athlon 64 FX and vice versa. Because core-logic chipsets impact performance, we used the same chipset in both Socket 754 (for the Athlon 64) and Socket 940 (for the Athlon 64 FX) in order to isolate the variable of CPU performance. An nForce3 150 powered both our Asus SK8N FX board and our Soyo CK8 A64 motherboard. Both rigs used Western Digital WD2500JB hard drives, ATI Radeon 9800 Pro cards, and the same amount of Corsair Micro DDR400 memory (the FX requires registered RAM).

The results: We've always known that the Athlon 64 3400+ is a peppy CPU but we were still surprised by just how fast this proc performed. The Athlon 64 FX-53 still holds the title as the fastest AMD CPU, but its 7 to 10% performance advantage is less likely the result of its dual-channel memory controller than its 200MHz clock speed advantage. The synthetic memory benchmarks show the FX-51 still outrunning the Athlon 64, but our real-world tests indicate this performance differential doesn't mean squat. Perhaps down the road we'll see more impressive real-life results from the Athlon FX line's incredible memory performance capabilities. What benchmarks the FX-53 wins, it does so by a slim 2 to 3% margin.

	2.2GHz Athlon 64 3400+	2.4GHz Athlon 64 FX-53	2.2GHz Athlon 64 FX-51
Quake III "Normal" Four (fps)	450	**484**	450
SiSoft Sandra RAM Composite	3,041	**5,685**	5,609
Premiere Pro (sec)	751	**684**	743
3DMark 2001 SE	19,990	**20,188**	19,820
AquaMark 3 CPU	9,638	**10,355**	9,829
3DMark 2003 CPU	757	**836**	780
UT2003 Fly By 6x4 (fps)	309.3	**329.9**	312.3
SYSmark 2004 Overall	173	**184**	174

What's holding back the FX? The primary suspect is the slower registered RAM that the Athlon 64 FX requires (remember, the A64FX is based on the server-orientated Opteron). AMD is expected to finally nix the requirement for registered RAM when it moves both the A64 and A64 FX to the new Socket 939 at the end of 2004. For now, FX-53 is the fastest AMD, but the 3400+ is plenty swift.

Originally published June 2004

biggest enhancements include 13 new instructions called SSE3, double the amount of both L1 and L2 cache (16KB and 1MB, respectively), and a new pipeline with a whopping 31 stages. Better thermal protection and enhanced Hyper-Threading were also included.

Interestingly, Prescott also included a new feature that allows the CPU to tell the system how hot it can run. Before, CPUs were generically assigned thermal limits based on the entire line. With the Prescott, each chip has individual points they can reach before telling the system to throttle down. This new feature was so advanced that its ramifications weren't even clear to us. Intel said the average consumer with a properly cooled CPU would never even notice the feature.

Why So Slow?

Unfortunately, during testing, Intel's new Prescott underwhelmed us. It barely held its own when going up against the older Pentium 4 Extreme Edition; the P4EE's huge 2MB Level 3 cache allowed it to outrace the Prescott in many tests. But over time, we explained, the Prescott's performance would exhibit "hockey-stick style performance increases as applications become more capable of taking advantage of the new instructions and extended pipeline."

An analogy will help explain this statement: A CPU's pipeline is much like a car factory's assembly line. Over at the Athlon XP factory, which has 10 stages (that is, 10 assembly line stations), each worker at each station is assigned a relatively large amount of work. For example, a single worker might put on a hub cap, screw in a dashboard, and install windshield wipers—and all this work must be completed before the unfinished car can proceed down the line. Because only one worker can attend to the car at any given time, the assembly line moves only as fast as the slowest worker on the line. Same goes for CPU pipelines.

Now, over at the Pentium 4 factory, there are 20 stages, or 20 workers attending to number-crunching the instruction at hand. And because there are more workers working on the line, each P4 worker has relatively fewer tasks to perform at his particular station. Thus the P4 assembly line can move along much, much faster than the Athlon XP assembly line with its short staff of just 10 workers.

To continue our analogy, for its Prescott architecture, Intel has hired 31 hard hats to build the car. So instead of each worker having to perform two tasks (say, putting on windshield wipers and installing an airbag), each worker simply screws on a single lug nut before sending the car along. The entire assembly process is completed more quickly because the production line is moving at breakneck pace.

We concluded that at 3.4GHz, the Prescott was simply idling; at this low speed it wasn't really even using the extended pipeline, which explained the lackluster benchmark performance when compared to AMD's Athlon 64 and Athlon 64 FX CPUs. It will likely take between 6 and 12 months for applications to take advantage of the CPU's much longer pipeline and new instructions. We expect that once Prescott's full potential has been reached via more rigorous CPU utilization—especially in the dual-core configurations Intel has discussed for Prescott—the chip will make a strong run against AMD's 64-bit processor lineup.

Intel Comes Clean Around 64-bit

In mid-March, Intel finally came clean and admitted that its long-rumored 64-bit extensions for the x86 were real and coming soon. This acknowledgement confirmed our suspicions, which had been fueled by the fact that, when released, the Prescott Pentium 4 had millions more transistors than its new feature list could explain.

For *Maximum PC* columnist Tom Halfhill (author of "Fast Forward," which appears in our "Quick Start" section), the disclosure raised a bunch of new questions. For example, how would Intel's extensions compare with AMD's? And would the two 64-bit architectures be fully compatible with each other?

Halfhill spent a week slogging through the 64-bit programming manuals from each company (five volumes from AMD, two from Intel) and interviewing their engineers. He compared the two CPU's 64-bit instruction sets, register files, memory-addressing schemes, context-switching behavior, interrupt handling, and support for 16- and 32-bit execution modes. Two conclusions emerged: Intel definitely had patterned its 64-bit architecture after AMD64; and, with a few exceptions, the architectures were *almost* completely compatible.

Choosing the Right CPU

Three thoughts to keep in mind when shopping for your next CPU

One of the most important decisions you're going to make in building your new PC is which CPU to use. Choosing an Athlon 64 FX or Pentium 4 Extreme Edition or even a Prescott will dictate what motherboard you buy, potentially what RAM you'll have to buy, and to some extent it could even influence what power supply you buy. With this in mind, *Maximum PC* presents some quick, useful thoughts you should consider when choosing your next CPU:

Function is everything: As you contemplate which CPU you'll choose, consider what you'll be using your PC for. If you're planning on using Adobe *Premiere*, you'll want to go with the Pentium 4 Extreme Edition's superior number-crunching capabilities. Conversely, if you plan on playing lots of games, you'll want to think long and hard about an Athlon 64 FX.

Does Megahertz matter? Watching the meteoric rise of the Pentium 4's clock speeds, we've certainly been conditioned to think that megahertz is the final word on processor speed. But the truth is that the architectures of the two leading CPU families are so different that clock speed can be misleading. As an example, the AMD's FX-53 runs at 2.4GHz, while the P4 Extreme Edition runs at 3.4GHz. To give you an idea of how drastically things can be different from CPU to CPU design, consider the original Pentium 4. Launched at a 1.5GHz, many people reasonably assumed the Pentium 4 was much faster then the Pentium III, which at the time was limited to 1.1GHz. Due to the core architecture differences, the Pentium 4 was actually slower in many applications out at the time, despite its 400MHz clock-speed advantage.

Bus Speed: The frontside bus of the CPU is the path that gets data from the CPU to the chipset. Basically, higher frontside bus speeds are better.

The historical significance of these two conclusions was astonishing. Intel invented the x86 microprocessor architecture in 1978 and had aggressively guarded it for 26 years. AMD began licensing the x86 from Intel two decades ago, then fought a long legal battle to continue making x86-compatible processors after the companies became enemies. Now, in a stunning role reversal, AMD had introduced the most important extension of the architecture since 1985 (when the x86 expanded from 16 to 32 bits), and Intel had to resort to basically reverse-engineering it!

Intel called its 64-bit x86 architecture Extended Memory 64 Technology (EM64T). The Prescott has EM64T, but it's not activated in current versions of the processor. Instead, Intel announced, EM64T will officially debut in the Nocona Xeon chip for dual-processor servers, due to ship in June 2004. (AMD64 processors, on the other hand, have been shipping since early 2003.)

Both EM64T and AMD64 have identical register files and nearly identical instruction sets. The differences come down to seven instructions. One instruction is unique to Intel, and the other six are supported by both companies, but not always in the same execution modes. This explained Intel's reluctance to guarantee that 64-bit software will always be compatible with both 64-bit architectures, although Intel did promise to run the same 64-bit operating systems as AMD64. In practice, we don't think the instruction-set differences will cause problems for users. Future versions of EM64T and AMD64 will probably resolve their minor differences and eventually become 100 percent compatible.

CPU Shootout: Pentium 4 Extreme Edition vs. AMD's FX-53

Two processors enter; only one emerges triumphant!

When people ask us questions about processors, they don't want to know which CPU is cheaper or which gives the best return on investment. *Nooo.* The only question that matters is which CPU is faster: Intel's Pentium 4 Extreme Edition or AMD's Athlon 64 FX-53? To find out, we ran the FX-53 against the 3.4EE on four leading chipsets: Intel's 875P, VIA's PT880, VIA's K8T800, and nVidia's nForce3 150. We used the same basic components and drivers for each respective platform, although we did have to use registered memory for the FX because of its RAM requirements.

The results: Our Lab tests produced mixed results. Instead of a nice tight grouping of victories in a single column that would clearly indicate which CPU is faster, the wins were all over the map. The P4EE won the largest number of tests, but the FX-53 also notched its share of victories.

With these kinds of results, the only thing that's clear is that we cannot pronounce a winner. Subjectively speaking, though, the Athlon 64 FX "feels" faster in games that don't have built-in benchmarks, while the Pentium 4 Extreme Edition "feels" faster in most applications that don't stress floating-point math. The P4EE is also faster in newer apps, while the Athlon 64 FX is faster in older apps.

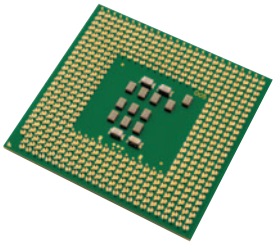
Originally published June 2004

CPU	2.4GHz FX-53	2.4GHz FX-53	3.4GHz P4EE	3.4GHz P4EE
Chipset	VIA K8T800	nForce3 150	i875P	PT880
SYSMark2004 OV	193	183	**196**	193
Content Creation Overall	222	213	**229**	225
Office Productivity Overall	**167**	158	**167**	165
Photoshop 7.0.1 (sec)	266	266	**254**	270
Premiere Pro (sec)	678	681	**515**	527
Mathematica (sec)	**504**	508.4	607.7	609.9
MusicMatch 8.1 (sec)	258	259	**225**	225
Comanche 8x6 FPS	73.89	73.1	**74.22**	73.06
AquaMark CPU	9898	**10,393**	**10,391**	9,850
3DMark2001 SE	20,349	**20,419**	19,898	19,655
3DMark 2003 CPU	779	807	**820**	793
Jedi Academy 12x10 (FPS)	**47.5**	41.3	46.2	46.3
UT Flyby (FPS)	321.9	**315.4**	293.5	291.5
QIII "Four" (FPS)	470	444	460	**498**
SiSoft Sandra 2004 RAM Composite (MB/s)	5,575	**5,809**	4,555	4,658

Pentium 4 Prescott: Up Close

Short term progress, long term revolution

Would we buy a Pentium 4 Prescott today? Unfortunately, the short answer is no. We're performance freaks, and right now the Pentium 4 Extreme Edition is the CPU tickling us in all the right places. However, at higher clock speeds, it's clear that Prescott will definitely be a force to be reckoned with. At that point, we'll be all over it. But at these speeds, it's in a firm third place.



Released in early 2004, the Pentium 4 Prescott boasted a radically redesigned architecture that made us bullish on its long-term prospects.

Surprisingly, Prescott pulls out a victory over both P4EE and A64FX in *Halo*. Unfortunately, faster *Halo* frame rates are about the only good news for the CPU in gaming. In general, the Prescott turns in pretty piss-poor frame rates against the P4EE at the same clock speeds and the Athlon 64. The Prescott does hold its own in *SYSmark 2004,* though, and beat the mighty P4EE in *Premiere Pro*. Unfortunately, the P4EE smokes the Prescott in *MusicMatch*, *Photoshop*, and *Mathematica*.

Against the Athlon 64, the Prescott only manages to eke out wins in columns favorable to the P4 architecture: *Premiere Pro*, *MusicMatch*, *Jedi Academy*, and *SYSmark 2004*. It wouldn't be fair to describe Prescott's performance as dismal because it performs pretty closely to two extremely fast CPUs, particularly in applications. Only in gaming does the Prescott flag hard.

Be that as it may, with all the tinkering Intel has done to the core, we expected better performance out of the Prescott, so we're disappointed. If there's a silver lining here, it's that Intel has at least managed to keep the chip close to the speed of the current Northwood core despite a much longer pipeline.

We fully understand that Prescott won't hit its stride until it gets to 4GHz or so, but at the end of all our testing, we couldn't help but wonder if performance really isn't the major reason why Intel rejected the Pentium 5 name.

Originally published March 2004

AMD Increases Clock Speeds

As the year closed, AMD revved both of its 64-bit CPUs. The company released a new 2.2GHz Athlon 64 3400+, which replaced the 3200+ as the top of the Athlon 64 line. The company also released a new 2.4GHz FX-53—the highest clocked AMD processor ever introduced.

Interestingly, when the FX-53 hit the shelves, its predecessor, the FX-51, was retired; AMD announced that it would no longer manufacture the older CPU. Normally, Intel and AMD both continue to supply slower versions of chips when they introduce new ones. By making the FX-51 obsolete, it appeared that AMD hoped to create a perception of greater status for its new CPU.

Intel's New Naming Conventions

In late April 2004, Intel, in an attempt to alleviate the confusion of consumers struggling to distinguish a 2.8GHz P4 from a 2.80C GHz P4 from a 2.80E GHz P4 from a 2.80A GHz P4, announced a brand new naming scheme that de-emphasized clock speeds in favor of feature sets.

In the new naming scheme, which debuted late in the summer of 2004, model numbers replaced clock speed as the key component of each CPU's name. For example, a Pentium 4 3.4GHz Prescott core became a Pentium 4 550. A 3.6GHz version is labeled P4 560, and the Extreme version P4 760. The new naming scheme is similar to the way BMW names its automobile lineup. In fact, Intel sought the high-end automaker's permission before announcing the news. In the new CPU lineup, the 300 series represents budget chips, the 500 the midrange, and the 700 designator represents the top dogs.

The model numbers are designed to help consumers understand that clock speed isn't everything, and that cache size, bus speed, and architecture are also important. The company hopes people will look to the model number to guide them to the level of performance they are willing to pay for, and then ask more questions about cache size and bus speed among the CPUs offered in that tier.

Maximum PC applauded the shift; however, we also believe that stating the clock speed of a CPU is critical for our market. It's highly likely, after the new naming convention takes hold, that we'll still include the clock speed of a CPU along with the new naming convention.

Looking Ahead: CPUs

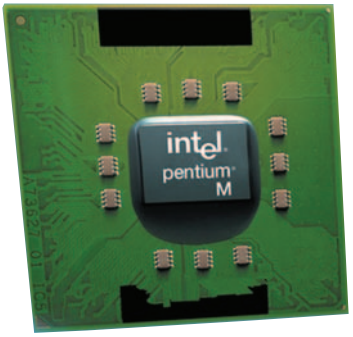
Look alive—the future will bring a slew of new processors and architectures!

So what's on tap from Intel and AMD for the next twelve months? A whole lot—especially because of a major change in strategy for Intel.

When Intel released the Pentium 4, the company expected the NetBurst architecture upon which its shiny new CPU was based to eventually reach 10GHz over the architecture's lifetime. Those plans recently came to a screeching halt when Intel announced it was killing Tejas—the successor to the Prescott P4—because of unmanageable heat issues. Tejas was rumored to include additional instructions (perhaps SSE4), slightly more L1 or L2 cache, and possibly a redesigned core. Many expected that Tejas would be called Pentium 5 when released.

In its place: A new approach to CPU design emerged that emphasizes dual-core processors based on the mobile Pentium M chip.

If you currently think of your CPU as having one brain in it, a dual-core CPU will have the equivalent of two brains, which will theoretically allow your PC to perform more than one task at a time with even higher performance than before. Both Intel and AMD have planned to use multiple cores in single chips eventually. Intel simply moved its plans up by about a year, a shift that makes a whole lot of sense, given Microsoft's assertions that Windows Longhorn—the next-generation of the Windows OS—will run better with dual-core CPUs.



In early May 2004, Intel shocked everyone by announcing that it was ditching many of its upcoming new Pentium 4 designs. In their place: a new strategy that would focus on dual-core processors based on the Pentium M processor shown here.

So what happens to Prescott amidst this radical change of plans? Intel still says Prescott is on schedule to hit the 4GHz mark this year. Furthermore, Prescott will get

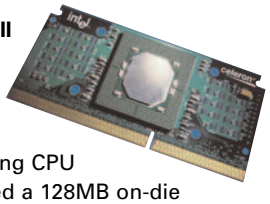
Our 5 Favorite CPUs of All Time

So many years…so many CPUs. The *Maximum PC* Lab staff is used to arguments that spontaneously erupt over historical discussions, but nothing prepared us for the verbal fist-fight that resulted from trying to come up with our favorite CPUs of all time. Read and enjoy!

Intel Pentium

After a landmark court ruling in the early '90s forced Intel to halt its x86 naming convention at the 486 CPU, Intel came up with a new name for its CPUs: Pentium. The name stuck like glue, and the line of processors is the best known in the world.

Intel Pentium II Celeron 300A



Running at 300MHz, this forward-thinking CPU design featured a 128MB on-die cache, but the real secret to this $100 CPU was its ability to consistently overclock to 450 MHz. Because it boasted a full-speed on-die L2 cache, it was actually faster (and less expensive) than the equivalently clocked Pentium II core that it was based on. We fell in love instantly.

2MB of cache a la the Extreme Edition, enhanced security via the LaGrande technology, 64-bit support, and several other new features like SpeedStep and Vanderpool's virtual capabilities. The big news, however, is that Prescott will apparently be moved to a dual-core design. To us, these ambitious plans for Prescott mean the P4 still has some life left in it.

AMD Maintains a Full Plate

While AMD had no significant response to Intel's re-focusing, the company's plate will be equally full as it pushes out several new CPUs to keep itself competitive. In the first half of 2004 the company is expected to introduce a chip code-named Newcastle. Like the current Athlon 64 and Athlon 64-FX, the chip will be based on a 130 nanometer process, but it may sport just 512KB of cache compared with the 1MB in Athlon 64 and Athlon 64-FX. Why build such a part? The short answer is that the large size of the A64 and A64-FX core costs too much. By shrinking the cache, AMD can produce more CPUs for less money.

In the second half of 2004, AMD plans to introduce the "San Diego" and "Winchester" CPUs using a new 90nm process with Silicon-On-Insulator technology (SOI), which makes for a faster electron flow, which allows CPUs to eventually hit higher clock speeds.

Not much information is available about San Diego, but we're guessing it will be similar to the current Athlon FX except smaller, faster, and able to support nonregistered dual-channel DDR400 and possibly even dual-channel DDR2 memory.

Winchester follows the lead of the plain-jane Athlon 64 and will offer only single-channel support, but will be built on the more efficient 90nm process with SOI. The move to 90nm will be critical for AMD if it is to compete with Intel on price—its 130nm chips are simply too big. We've also heard rumors of AMD producing two budget chips using the same Socket 754 boards as the Athlon 64 3200+, but without the 64-bit support. We don't see them happening, but we're the first to admit that no one knows for sure.

AMD's real ace in the hole for its CPUs is a feature called "execution protection," which is also known as "no execute," or simply NX. Microsoft's upcoming Service Pack 2 for Windows XP will rely on the CPU's ability to mark regions of memory where code cannot be executed. Microsoft expects NX to help reduce the amount of buffer-overflow viruses and worms, such as the MSBlaster worm.

The good news for AMD, and the bad for Intel, is that NX apparently requires hardware support at the processor level. And so far, only 64-bit chips support it: Athlon 64, Athlon 64 FX, Opteron, and Intel's Itanium. Intel's official word is that it is "evaluating supporting this feature in our client products." We take that to mean "no" or "not yet." With security becoming a bigger and bigger issue, you can bet Intel is scrambling to include some kind of support for NX.

Finally, AMD should also see a Windows OS for its 64-bit CPUs by the end of 2004. We hope.

AMD Athlon

AMD's first Athlon processor still owns a soft spot in our hearts. A fast performer, and a welcome, affordable alternative to Intel's more pricey CPUs, the Athlon allowed less-than-rich PC builders extra options. Additionally, the Athlon was also remarkably stable. This proc also represented one of AMD's first big gambles because the CPU was the company's first CPU that was not pin-compatible with Intel slots/sockets.

Pentium 4 Northwood

Released in January 2002 at a clock speed of 2.2GHz, the Northwood core was the second iteration of the Pentium 4. The previous architecture was the P4 Willamette. We admired the new CPU's 0.13 micron fab process, copper interconnects, and Hyper-Threading capabilities, which made the chips faster and more efficient.

Athlon 64 FX

Hopefully you've already read our glowing words of praise regarding the biggest CPU release in AMD's career. This 64-bit proc—the first 64-bit chip released for the mainstream masses—blew us away with its ability to run both 32-bit and 64-bit code. As of this writing, Intel still hadn't released its own dedicated 64-bit processor.

Chapter Six

Hard Drives

Substantial performance gains and gargantuan new sizes surprised and delighted us.

Hard drive technology has advanced in leaps and bounds over the past year. Numerous record-breaking drives were introduced, as well as an all-new storage interface that offers more speed, features, and flexibility than the aging parallel ATA standard.

It's been quite a year for the storage industry, as we've seen the repeated shattering of performance records and the adoption of an all-new interface that should last for at least the next decade. There were also major advances in the portable storage market; flash memory-based storage gained enormous market share, and tiny hard drives began to rise to prominence as well.

The rise of P2P file sharing as well as the emergence of recordable DVD drives (and the subsequent DVD "archiving") has fueled this explosion of drive capacities, as people who once thought they'd never fill an 80GB drive now find themselves out of space and clamoring for more.

Western Digital's all-new Raptor drive is the first, and only, 10,000rpm ATA drive on the market.

The biggest trend though, on the whole, is the migration of enterprise features and specifications into consumer-level drives.

The Raptor Takes a Bite Out of the Competition

The most shocking hardware introduction of 2003 was Western Digital's 10,000rpm Raptor ATA drives. When released in Q2 of 2003, these drives were the first ATA-based hard drives to boast a rotational velocity of 10,000rpm, compared to the competition's 7,200rpm. The introduction of these drives was so startling because for years 10,000rpm drives existed in the server- and workstation-oriented enterprise market (which also has 15,000rpm drives). These drives are insanely fast, but also extremely expensive. Consequently, conventional wisdom believed there would always be a wide performance margin between consumer-level drives and enterprise "solutions." The Raptor changed all that.

The increase in rotational velocity afforded the Raptor an enormous performance advantage over every other ATA drive on the market. As an example, the fastest ATA hard drive we've tested—Hitachi's 7,200rpm 7K400—has an average read speed of about 47MB per second. The Raptor, on the other hand, can read data off its platters at an average speed of about 62MB per second.

The Raptor drive was initially marketed as an enterprise solution, in that it afforded similar performance (and in some cases, better performance) to 10,000rpm SCSI drives at almost half the price. But its stunning performance made it a must-have for the PC enthusiast crowd as well. This came as a big surprise to the folks at Western Digital, who were marketing the drive to corporations and other server-oriented applications.

The only drawback to the Raptor was its pint-size capacity. It was released initially in a single-platter 36GB version. Later, a two-platter 74GB version would be deployed to satiate the needs of consumers who felt 36GB just wasn't big enough, especially because 7,200rpm drives were being offered in capacities of 250GB at roughly the same price as the wee Raptor. The reason these drives are made with such small capacities is that they're still enterprise oriented. In that market, when a backup drive fails, the smaller the capacity of data loss, the better.

Western Digital followed up the 36GB Raptor's success with a 2004 Q1 release of a two-platter version boasting a 74GB capacity. This drive was even faster than the first version due to the extra pair of read/write heads as well as some fine-tuning of some internal mechanics. How far Western Digital intends to stretch the Raptor's capacity and availability remains to be seen, but as of June 3, 2004, it was clearly the undisputed performance leader in the ATA hard drive market.

> ***THE INCREASE IN ROTATIONAL VELOCITY AFFORDED THE RAPTOR AN ENORMOUS PERFORMANCE ADVANTAGE OVER EVERY OTHER ATA DRIVE ON THE MARKET.***

MAXIMUM PC KICK ASS PRODUCT

Western Digital 740GD Raptor

The fastest ATA drive on the market just got faster (and bigger).

What the 74GB Raptor lacks in sheer capacity, it more than makes up for in performance.

We can sum up the performance of Western Digital's 74GB Raptor with two words: "holy" and "schnikes." This drive goes beyond fast. Faster than any other ATA drive on the market, to be exact. That not only includes the Raptor's 7,200rpm brethren (the 740GD is after all a 10,000rpm drive), but also its 10,000rpm predecessor, the 36GB Raptor.

When observed resting in its typical drive-cage habitat, the Raptor resembles its predecessor. Like the 36GB version, the drive's sides are adorned with molded heat sinks, and its backside sports a Serial ATA data port, a 15-pin Serial ATA power connector, and a legacy four-pin ATX connector. Western Digital ships the drive with its special SATA cable dubbed SecureConnect, which is an inch long and plugs into both the data *and* power connectors for a more reliable connection than the standard SATA cable.

Delving inside the drive, we find anything but the Raptor of yore. In addition to its shiny new second platter, the 740GD has been upgraded with a new feature for the enterprise crowd called Command Queuing. This feature allows the drive to create a queue while executing commands rather than having to wait until a command is completed before receiving the next one. Unfortunately, since this feature must also be supported in the SATA controller, and these controllers don't exist yet, it wasn't implemented in our test drive. Even without this cool feature, the Raptor still performed extremely well.

As the benchmarks show, the 74GB Raptor is unbelievably fast. Its average sustained transfer rate of 61MB per second set a new Lab record, and its random access time of 7.8 seconds makes the drive almost twice as fast as most 7,200rpm drives and just as fast as 10,000rpm SCSI drives. Thanks to the Raptor's fluid-dynamic bearings, it's also quiet. Rounding out the stellar package is a five-year warranty.

What else is there to say? The numbers do all the talking. In just about every benchmark we ran, the 74GB Raptor blew us away, not to mention the competition. All we can do now is wait until the other manufacturers release their own 10,000rpm SATA drives. Then it will surely be "go time!"

MAXIMUM PC VERDICT 10

+ VELOCIRAPTOR

Stunning performance, decent capacity, quiet operation, and a five-year warranty.

– VELOUR

New features are only beneficial in a multi-user environment.

$300, www.westerndigital.com

Serial ATA Arrives

The arrival of Serial ATA (SATA) in 2003 marked the dawning of an exciting new era in storage device connectivity. SATA is destined to become the de facto interface for *all* storage devices in the next few years. While hard drives are now just starting to migrate to the new connector and interface, in a year or two's time we'll begin to see optical drives use the connector as well. The SATA interface should also make major inroads in the enterprise market as well, since it offers hot-swapping abilities and other features found previously only in enterprise drives.

Serial ATA's improvements over the ubiquitous 40-pin parallel ATA cable are numerous. First, it's about one third the size, which makes it easier to route through a case's messy internals; this also allows for increased airflow inside the PC case. SATA also jettisons the age-old Master/Slave relationship required by IDE channels in favor of a point-to-point connection. This means no more fussing with jumpers or any of that ha-hooey. With SATA, you plug the drive into its port, and it's ready to go.

Additionally, the SATA channel is a serial connection, whereas parallel ATA is, um, parallel. This grants the technology standard enormous bandwidth advantages

and offers plenty of headroom for future drive development as well. In fact, the main reason Serial ATA was introduced in early 2003 was because parallel ATA was beginning to run out of steam in terms of drive data transfer rates.

In early 2003, ATA drive manufacturers began to see the writing on the wall. ATA hard drives began to bump up against the limits of the ATA spec's 100MB-per-second transfer rates when reading directly from their onboard memory (known as *burst mode*). As a result, the ATA spec was opened up a bit. ATA/133 was introduced, which allowed for an extra 33MB per second of bandwidth. Still though, having a parallel drive running on ATA100 or ATA133 is like driving a car that can only do 50–60MPH down a highway with a speed limit of 100–133MPH. Regardless, many drive makers balked at this new specification due to the general consensus that the 40-pin connector that was being used was seen as unfit for ever-increasing data speeds. Drive manufacturers feared that cross-talk and data corruption would be caused by sending too much data at too high a speed down too narrow a bus. It was a bad situation. Serial ATA would remedy this problem.

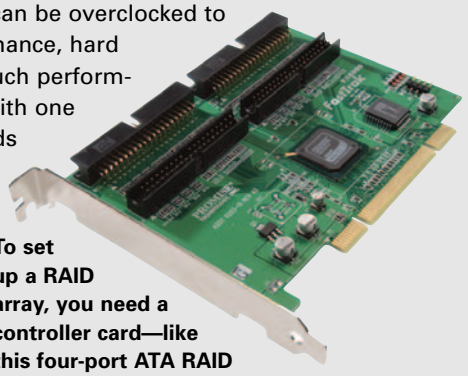
Initially introduced as Serial ATA 150, the new interface allows for up to 150MB per second data transfers, even though today's fastest drives have barely broached the 60MB-per-second barrier. Still, though, this amount of data opened the channel up. Drive makers around the world breathed a sigh of relief, and began offering all of their top-of-the-line drives in the snazzy new interface.

The SATA spec will increase to SATA 300 sometime in late 2004, allowing for—you guessed it—up to 300MB per second data transfers, and then will probably double again to SATA 600 in 2005 or 2006. *Maximum PC* believes that once it reaches SATA 600, the spec will likely stabilize for approximately a decade or longer.

While the adoption of Serial ATA is a fantastic development for hard drives in the long run, to be honest, in the short term it hasn't had much

RAID: Do You Need It?

Although videocards and CPUs can be overclocked to unleash some additional performance, hard drives are largely incapable of such performance-improving optimizations, with one exception—RAID. The term stands for Redundant Array of Inexpensive Disks, and here's what that means in English. RAID is the process whereby two or more hard drives are joined, like Supertwins, to effectively work as a team and share the workload. In theory, two drives working together as a single drive can almost double the data transfer rates of either of the single drives. This performance boost is due to the fact that rather than one drive, for example, having to write a 100MB file to its platters, each drive (in a two-drive scenario) simply writes 50MB a piece. Voilà—the time it used to take to write that same file has been cut in half.



To set up a RAID array, you need a controller card—like this four-port ATA RAID controller from industry stalwart Promise Technologies.

There are several different types of RAID configuration, but the two most common are known as RAID 0 and RAID 1. The type of RAID discussed previously is known as RAID 0. It involves pairing two drives together as one big drive to share the workload. A RAID controller interleaves the data across both drives, treating them as one large volume. This type of RAID can provide an incredible performance gain over a single drive, but the downside is that if one drive fails at any time, the entire array is hosed.

The other most common type of RAID among home users is RAID 1, which is known as *mirroring* since it mirrors all data from one drive to a backup drive. This "mirror" copy of your hard drive can then be used in the unfortunate event of your primary drive biting the dust.

All that is required to create a RAID array is two of the same drives and a RAID controller, which are offered in most of today's performance-oriented motherboards. You can also buy an add-in PCI RAID controller for around $40. Some of these controllers even support RAID 0+1 for a four-drive striped/mirrored array. How's that for speed and security?

effect on actual hard drive performance. This has been true of all the ATA interface speeds over the years, which are misleadingly labeled with their maximum transfer rates, even though hard drives can't actually take advantage of those speeds.

For example, when the ATA specification moved from ATA/100 to ATA/133, drives themselves didn't change a lick. They were the same drives as before—except that the boxes had stickers shouting "133MB per second!" The same situation applies to Serial ATA; no dramatic performance bump accompanied the debut of the new spec. In fact, most high-end hard drives are offered in both SATA and Parallel ATA (PATA) configurations. In late 2003, in an attempt to determine the difference, if any, between the two new standards, we took two of the same drives in each configuration and ran our rigorous suite of benchmarks on them. The results were surprising: The PATA drive was a teeny bit faster than the SATA drive, but the numbers were so close, it was basically a wash.

Nonetheless, Serial ATA is a very good thing for the industry—and for consumers. Our advice regarding SATA is this: The Parallel ATA interface isn't going away for a least another few years, so don't feel rushed to jump on the SATA train. Every manufacturer has plans

MAXIMUM PC KICK ASS PRODUCT

Hitachi 7K400 DeskStar

Four-hundred *expletive deleted* gigs of storage!

If hard drives were nations, the 400GB DeskStar would be China. And like Red China, the 7K400 rules the land of 7,200rpm drives with an iron fist.

That maniacal howling and crackling of thunderbolts you hear? It's just us firing up *BitTorrent* and downloading everything we can get our hands on. Now that we've harnessed the power of Hitachi's 400GB DeskStar, we can do that sort of thing. Soon, the entire Internet will be ours. Precious Internet…

Ahem. Hitachi's all-new DeskStar 7K400 continues the company's dominance in the 7,200rpm market by not only being the fastest drive of its kind, but also the largest—by a wide margin. The jump from the 250GB 7K250 to the 400GB 7K400 was made possible by adding two platters to the drive's design, bringing the total to five aluminum platters with 10 read/write heads. But Hitachi didn't stop there. It also added a new feature dubbed Rotational Vibration Safeguard Technology (RVS) that detects excessive vibration in multi-drive environments and adjusts its operation accordingly to ensure data integrity. The drive also comes with a new "latched" Serial ATA connector to ensure a stronger connection to the drive—an excellent idea, seeing as the standard SATA connector is extremely flimsy and prone to coming loose. Finally, the drive includes the now de rigueur 8MB buffer and fluid dynamic bearing (FDB) spindle motor, which reduces operational noise and improves reliability.

During testing, the drive scored almost exactly the same as its 250GB counterpart, which isn't surprising since it shares the same internal technology. The 400GB drive performed an average read speed of approximately 46MB per second and scored random access times a smidge *below* Hitachi's spec for the drive—impressive indeed. The drive was even a tad faster than the 250GB version in a few benchmarks—a representative from Hitachi says this is due to the additional read/write heads afforded by the five-platter design.

When all is said and done, we look at this drive and ask, "What's not to love?" It's the fastest drive in its class and has a 150GB capacity advantage over its competitors. It's also available in both PATA and SATA configurations, and comes with a three-year warranty. If it had a 10,000rpm rotational velocity, this would easily be a perfect 10—and then some.

MAXIMUM PC VERDICT 9

DESKSTAR

Huge, fast, with enterprise-class components and features..

PORNSTAR

Has to be a 10K drive to receive a 10 verdict.

$410, www.hitachigst.com

to sell its high-end drives in both configurations for the immediate future. But, if you want your drive to be as future-proof as possible, and are tired of hassling with thick ribbon cables as well as jumpers, make sure that your next drive is SATA.

Drives Get Buffer

Every hard drive includes a small amount of memory known as *buffer* or *cache memory*, and 2003 marked the first time we've seen an across-the-board increase in the size of these buffers in a long, long time.

For what seemed like an eternity, most consumer-level hard drives have shipped with a puny 2MB buffer, largely because memory is expensive; this helped keep the retail costs of drives at an affordable level. This changed in late 2001, when Western Digital announced its JB line of drives, which featured a whopping 8MB buffer. Prior to these drives, such expansive buffers were only found in drives destined for use in servers and other enterprise applications, but the JB drives broke down the buffer barrier once and for all. 2003 marked the adoption of the luxurious 8MB buffer by every drive manufacturer for high-end drives.

Serial ATA Explained

The serial ATA interface has its very own power and data cables. You'll notice the data cable is extremely small and thin compared to the 40-pin ribbon cable it replaces.

This is a Serial ATA drive with both power and data cables connected. As you can see, there is a legacy four-pin power connector as well, which can also be used. Both power connectors are present because only a small percentage of power supplies offer the SATA power connector.

While Serial ATA offers no significant performance advantages over parallel ATA, its cables are a lot easier to deal with and you also won't have to fuss with Master/Slave jumpers either.

To understand why this jump in buffer size made such a difference in performance, it's important to understand how a buffer operates. The buffer's job is to store information for quick retrieval by the operating system, since pulling data from a drive's cache is much faster than having the read/write heads position themselves over the correct location on the platters and retrieve it. Whenever you request data from your hard drive, the buffer intercepts the request and checks to see if it is holding onto it from a previous operation, and if so

"WE'RE NOT SURE WHAT THE FUTURE HOLDS, BUT OUR FINGERS ARE CROSSED THAT ALL THE DRIVE MANUFACTURERS WILL JUMP ON THE 10K ATA GRAVY TRAIN."

—LOGAN DECKER, FEATURES EDITOR

Maxtor DiamondMax Plus 9 250GB

A very nice all-around package.

Maxtor's top-of-the-line SATA drive is quiet as a mouse yet strong like bull.

Maxtor is no stranger to the Serial ATA universe. In fact, Maxtor is one of the companies that has been spearheading the adoption of the new interface (along with several other companies) for several years now, so it's no surprise its top-of-the-line SATA drive performs so respectably.

Like the other drives in this class, the DiamondMax Plus 9 boasts three 83GB platters for an overall capacity of 250GB, and comes with both the hot-swappable SATA power connector and the older four-pin ATX version. While you *have* to use the SATA data cable in order for the drive to operate, you can select which power cable you'd like to use, and if you plan on hot-swapping at all, you must use a SATA power connector. Rounding out the package is a hefty 8MB buffer and a three-year warranty.

In testing, the drive isn't the fastest in its class, but it's certainly not the slowest either. In some benchmarks, such as read speed, write speed, and burst rate, it's neck-and-neck with the fastest drives available. Its average read speed of 47MB per second is incredibly fast, as is its burst rate of over 103MB per second. But in other benchmark categories, such as "real world" tests and random access times, the Plus 9 was a sliver off the pace compared to other drives in the class. In fact, the Plus 9 achieved the lowest score of its class in our *H2Benchw* test's real-world application index benchmark. Interestingly, this dearth of desktop horsepower reappeared in our other real-world test, Bapco's *SYSmark 2002* Office Productivity script. This discrepancy between good benchmark scores and middling real-world performance could be chalked up to the fact that the drive's random access times are a about a millisecond below the competition.

All in all, the DiamondMax Plus 9 offers respectable performance, though it's not the leader of the pack. However, if making sure your PC is quiet as a mouse is a big priority, this drive's fluid-bearing motors make it one of the most peaceful we've recently sampled.

Maxtor DiamondMax

MAXIMUM PC VERDICT 8

GIGABYTE

Respectable performance across the board, and quiet.

SNAKE BITE

Sluggish "real world" performance.

$250, www.maxtor.com

the data can be delivered instantaneously. When the drive sends data from its buffer to the OS, this is known as its burst mode, which is an apt title because due to the small size of the buffer (traditionally 2MB even on a drive with over 100GB capacity), it can only send small pieces of data and only for a very short duration since the buffer empties rather quickly due to its small size. Today's fastest ATA hard drives possess burst speeds of around 110MB per second, but because drives operate in this mode so infrequently, this is only a small measure of a drive's overall performance.

Still, a larger buffer does increase a drive's performance significantly. To test the actual performance difference afforded by a larger buffer, we gathered together two identical drives from Western Digital; one with an 8MB buffer and one with a 2MB buffer. Side-by-side testing determined that the extra buffer helped achieve an approximate 30% increase in performance. Needless to say, 2MB buffers quickly made like leather pants and went out of style; every manufacturer has switched to a hefty 8MB buffer in its top-of-the-line drives, relegating the 2MB drives to budget status.

Portable Drives Get Potent

While desktop-oriented drives recently experienced the quantum leap from 7,200rpm to 10,000rpm spindle speeds, a similar leap in performance occurred in the portable drive segment as well, with the arrival of Hitachi's 7,200rpm 7K60 TravelStar. While desktop hard drives can be noisy and generate a lot of heat, this is no big deal since the emphasis is on flat-out performance. Notebook drives, however, need to be thin, quiet, and draw very little power in order to fit inside a compact laptop chassis and run off of a battery. These constraints, coupled with the reality that most laptop users don't demand ultimate performance, have resulted in notebook hard drives that operate at a lowly 4,200rpm (or lower) as well as 5,400rpm. This, in turn, has created a major performance bottleneck.

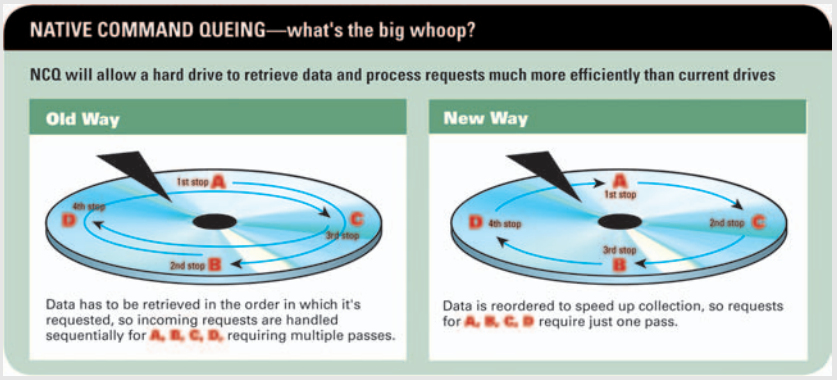
Hitachi performed an end run around these issues by developing an all-new slider apparatus (the tiny wing that supports the read/write heads as they hover over the platters) dubbed the Femto Slider. This groundbreaking technology is three times smaller than the unit used in other drives, and allows for lower power consumption as well as the ability to detect even smaller magnetic particles on the drive platter. The company's 7K60 also sports a capacity of 60GB, making it not only the fastest notebook hard drive, but also one of the highest capacity drives available.

Command Queuing Explained

All of the first-gen Serial ATA drives released in 2003 and early 2004 comply with the first version of the new interface—Serial ATA 1.0. This spec allows the drives to work properly, but doesn't include any significant new features or exciting advances over parallel ATA. Now that version 1.0 of the spec is stable, the industry is beginning to move toward version 2.0, which will offer a cool new feature called Native Command Queuing (NCQ). This feature will be programmed into all SATA 2.0 hard drives, hence the term *native*. In order to work, support for NCQ must also be built into the Serial ATA controller. We don't anticipate this to be an issue, since chipset makers will naturally adopt the new spec along with hard drive manufacturers.

NCQ allows hard drives to arrange requests in a queue and execute them in the fashion deemed to be most efficient. Non-NCQ hard drives must execute commands in the same order they are received, which is terribly inefficient. The best way to understand NCQ is to use an elevator analogy. Let's say you get in a non-NCQ elevator on the ground floor and press 10. Once it gets to the 2nd floor, someone gets in and presses 4. Now, a non-NCQ elevator would take you to the 10th floor, and *then* go back down to the 4th floor, whereas an NCQ elevator would realize the 4th floor is closer and stop there first, and then proceed to the 10th floor.

The real world benefits of NCQ are workload dependent, but it has the potential to offer a significant increase in disk I/O, which is good news indeed.


NATIVE COMMAND QUEING—what's the big whoop?
NCQ will allow a hard drive to retrieve data and process requests much more efficiently than current drives
Old Way
1st stop A
2nd stop B
3rd stop C
4th stop D
Data has to be retrieved in the order in which it's requested, so incoming requests are handled sequentially for A, B, C, D, requiring multiple passes.
New Way
1st stop A
2nd stop C
3rd stop B
4th stop D
Data is reordered to speed up collection, so requests for A, B, C, D require just one pass.

Native Command Queuing is a feature that will be implemented in hard drives beginning in late 2004. It allows a drive to form a queue of commands and execute them in the order it deems most efficient, rather than executing them in the order received.

IBM Sprinkles Pixie Dust on Its Drives

In 2001, IBM engineers developed a brand-new type of media for use in hard drive platters that was so cutting-edge it almost seemed magical. Thus, it was dubbed Pixie Dust. At the time, engineers estimated that someday this technology could be used to create desktop hard drives as big as 400GB. In early 2004 we saw this dream come to fruition with Hitachi's release of the 7K400, which was, you guessed it, a 400GB hard drive. Upon its release, this capacity dwarfed all other 7,200rpm ATA hard drives—the

largest capacity available before the drive's launch was a mere 250GB. Hitachi also uses Pixie Dust in its UltraStar notebook hard drives, and hopes to someday offer a portable drive with a capacity of up to 200GB.

These gargantuan capacities are possible because Pixie Dust solved a long-standing problem that has held back drive storage known as the *superparamagnetic effect*. This is when bits of data become so darn small they are incapable of holding a magnetic charge. As drive capacities increase, manufacturers have been forced to fit more bits of data on the same number of 3.5-inch platters, so the bits used to hold data have shrunk quite a bit over the years. As an example, in the past year alone engineers have found ways to squeeze over 20 *billion* more bits of data onto the same little drive platters, and drive capacities have been doubling every year as a result, accelerating the onset of the superparamagnetic effect.

To offset this limitation, IBM devised a new magnetic coating for its drive platters that uses a three-atom-thick layer of the precious metal ruthenium sandwiched between two magnetic layers. These multiple magnetic layers work in *opposite directions* to allow the bits of data to maintain their magnetic orientation, and therefore allow bit size to decrease without endangering data integrity. At the time of this discovery, drives were reaching upward of 40 billion bits of data per square inch, and engineers weren't sure how much further they could progress without hitting the superparamagnetic wall. With Pixie Dust in effect, however, Hitachi's 7K400 drive boasts 61.7 billion bits of data per square inch, and the company has estimated it will be able to drive that number up to 100 billion bits of data per square inch. Hitachi has begun using this new media, which is called *antiferomagnetically charged*—AFC for short—on all its drives.

Western Digital 250GB Media Center

Western Digital's Media Center is a 250GB backup drive, 8-in-1 media reader and USB hub all rolled into one.

It's always smart to have a backup drive, and one of our favorites is Western Digital's new Media Center. It's based on the company's top-of-the-line 7,200rpm Caviar SE hard drive, and offers both FireWire and USB 2.0/1.1 connections. The "media center" aspect comes in the form of a USB hub and an 8-in-1 media reader, which is a great idea since it integrates devices we'd otherwise have dangling from our PCs and accommodates convenient USB key usage (something we've long fantasized about). The media reader accepts all popular forms of removable media and even works when the drive is turned off. (The drive can be purchased as a non-Media Center version for $50 less.) It also incorporates an additional USB port on its rear, has two FireWire ports for daisy-chaining, and can be laid down flat or stood up on little feet as well. All in all, it's an excellent design.

For backup purposes the drive includes Dantz *Retrospect 6.5*, which is *extremely* easy to use. While it offers a lot of advanced features, its primary role of making backups is simple to master and hard to fault. An Automatic Backup button on the drive's faceplate will connect you with a wizard that walks you through creating a backup script that you schedule to run automatically. Or you can press the On Demand button on the drive's face to perform a spot-backup any time you want. The drive also has a handy built-in feature that prevents it from being turned off during a data transfer. The drive has to be turned on in order to perform a pre-scheduled backup, but since it gives off very little noise at idle this is not an issue.

Overall we were quite impressed with the Western Digital drive. The addition of the media center and other thoughtful touches show welcome innovation in a market that's largely bereft of fresh ideas.

Western Digital 250GB

MAXIMUM PC VERDICT 9

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Big capacity, fast, easy to use, snazzy media center.

– HEARTACHE

Twice the cost of the desktop version of the same drive.

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Our Favorite Workhorse Drives of All Time

Maximum PC presents the five drives that have won our hearts over the years

1998: Seagate Cheetah 9GB

This Ultra SCSI hard drive won our hearts, and our benchmarks, back in the day. It averaged read speeds of up to—hold your breath—16MB per second! And with its whopping 9GB capacity, it was one of the largest capacity drives available at the time.

1999: IBM UltraStar 9LZX

SCSI still ruled the roost back in 1999, with IBM's *muy rápido* UltraStar taking top honors. It spun at 10,000rpm and retrieved data at a smoldering 58MB per second. It was only 9GB and had a 4MB buffer, but man oh man, was it *sexy*.

2000: IBM DeskStar 75GXP

The DeskStar was truly a drive ahead of its time. It's five-platter design allowed it to leapfrog its competitors in the capacity war by almost double, and its read speeds of 28MB per second obliterated the competition. Sadly, this drive would go on to infamy and would be known as the "Deathstar" due to abnormally high failure rates.

2001: IBM 60GXP

Once again, IBM stole the show in 2001 with its all-new 60GXP ATA hard drive. Its average read speeds of 38MB per second catapulted it to the top of any PC enthusiast's Lust List. This drive marked a return to a three-platter design for IBM, mostly the result of the five-platter 75GXP fiasco.

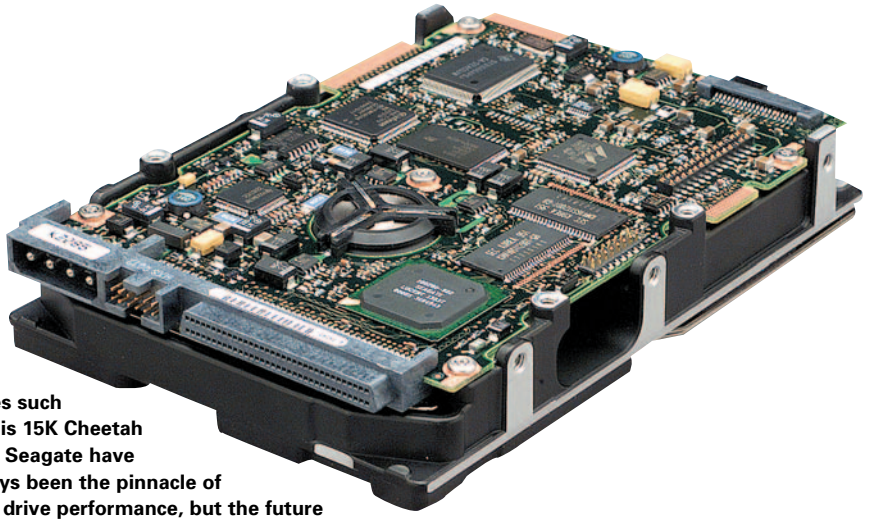
2002: Western Digital 1200JB

The JB in this drive's title stands for Jumbo Buffer, as the 1200JB was the first ATA hard drive to come with a fat 8MB cache at a time when every other drive on the market packed a miniscule 2MB of cache memory. The difference in performance was incredible, as it outpaced its rivals by a wide margin. Sure, the 1200JB only spun its platters at 7,200rpm, but those babies were packed full of data thanks to its 40GB-per-platter areal density.

Looking Ahead

The future of hard drives is so bright we have to wear shades.

It's always fun to gaze into the hardware crystal ball and speculate about upcoming technologies, but given the tight-lipped nature of most companies, it's often difficult to know with precision what exactly is coming down the pike. Still, industry trends as well as the competitive nature of the storage market offer some hints as to what lies ahead. Here's what we see in the future.



SCSI drives such as this 15K Cheetah from Seagate have always been the pinnacle of hard drive performance, but the future will surely see ATA drives narrow that gap.

10,000rpm ATA Arrives in Bulk

As of this writing, Western Digital is the only company to offer a 10,000rpm ATA hard drive. The drive, known as the Raptor, was initially built and marketed toward the enterprise crowd as an inexpensive alternative to 10,000rpm SCSI drives, since it offered similar performance for almost half the price. Upon its release, the drive became an instant sensation due to its major performance advantage over every other 7,200rpm ATA hard drive on the market. Not surprisingly, it quickly became the darling of our Lab and the hardcore PC enthusiast crowd. Given this drive's success it seems only natural that other manufacturers will follow suit and offer their own 10,000rpm drives. No manufacturers have announced plans to follow Western Digital's lead, but given how popular the drive has been for both the enterprise and home-consumer crowds, it seems highly improbable that other manufacturers would ignore the inherent advantages—commercial and otherwise—of such a design.

SATA 2.0

We touched on the second revision of the SATA spec in the sidebar on page 87, mentioning that one of the big features of the SATA 2.0 is Native Command Queuing. This feature will certainly make it into hard drives and controller cards in 2004, and we anxiously await the chance to benchmark such a drive. Version 2.0 of the SATA spec will also offer other important changes, the first of which is a speed bump to 300MB per second for the interface.

"THE WORST PART ABOUT TESTING HARD DRIVES IS WE HAVE TO FILL THE ENTIRE DRIVE TO TEST IT. WE DIDN'T KNOW WHETHER TO LAUGH OR CRY WHEN WE HEARD ABOUT HITACHI'S 400GB DESKSTAR."

—JOSH NOREM, CD AND WEB SITE PRODUCER

For the next few years, the speed bump from the current 150MB per second to 300MB second will be inconsequential. While it's a significant widening of the data throughput channel, current hard drives aren't even close to performing at the interface's maximum speed.

Other big news: An all-new "latched" connector is due to arrive late in 2004, which is a welcome change, as the version 1.0 connector can easily become disconnected. The new connector, we are told, will feature a latch that ratchets the plug down into the port, ensuring a stable connection. The other big SATA 2.0 spec advancements are a port multiplier that will let you connect several SATA devices to a single port, and an official external cable design, which will facilitate the creation of external SATA drives.

Interestingly, given SATA's blazing speed and hot-swapping capabilities, external SATA could spell the death knell for the use of external USB and FireWire for connecting external data storage devices, since it's about three times faster. Time will tell.

Bigger and Faster

Aside from emerging new technologies, we assume that it's a given that drives will continue to grow in both size and speed. Since Hitachi still has quite a bit of headroom left with its Pixie Dust technology, we're left to ponder how long it will be before we see drives nudging upward of half a terabyte in size.

Also, since the trend as of late has been the migration of enterprise technologies and features to desktop drives, we anticipate even larger drive buffers—possibly up to 16MB—in the very near future. Such buffers already exist in the corporate world. Just imagine a 500GB drive with a 16MB buffer—we can hardly wait.

Not All Storage Devices Are Big and Loud . . .

Hard drives and storage media come in all shapes and sizes. Beside the traditional 3.5" internal drive, there are also a plethora of portable and flash memory-based drives to fit your need for storage on the go. Here's a breakdown of the smaller, quieter, and more transportable options available.

M-Systems DiskonKey

Flash memory-based USB keys are one of those inventions that constantly make the *Maximum PC* Lab wonder how the world ever operated without them. With their large capacities, ultra-portability, and ability to work just by plugging them into any PC or Mac, the USB key has replaced both the floppy drive *and* the CD-RW for quick transport of files. They range in capacity from 16MB to 1GB.

Archos ARCDisk 20GB

This is a bus-powered—meaning no power brick is required—20GB hard drive that's about the size of a thin mint. Its USB 2.0 interface is fast enough for routine file transfers, and it fits right in your pocket. It's not a speed demon, however, as it uses a 4,200rpm drive, but we still love the little ARCDisk because it's so spacious and portable.

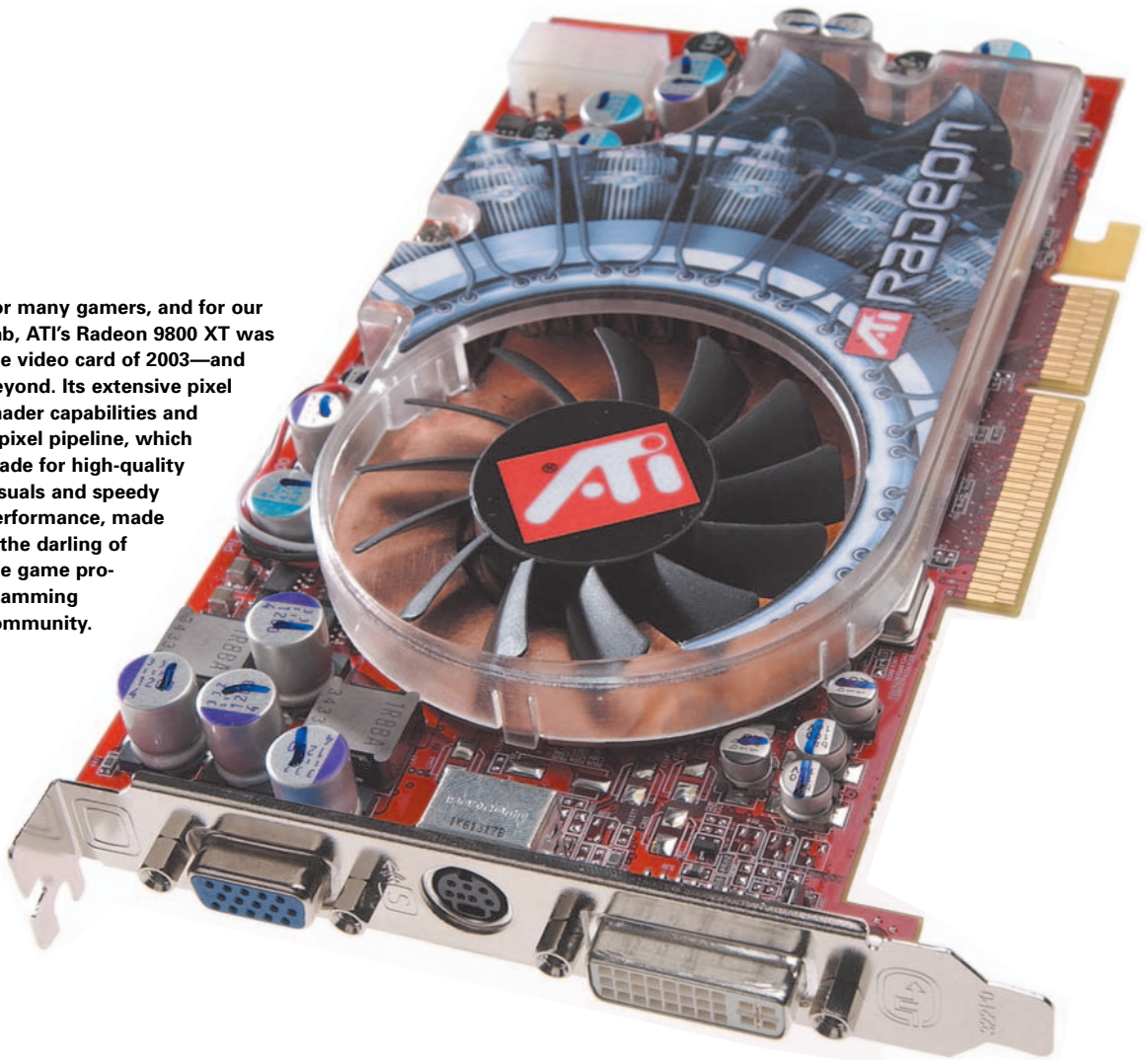
Hitachi Microdrive

It's not the world's smallest hard drive, but it's pretty darn close. Hitachi's Microdrive (formerly made by IBM) set the storage industry on its ear when it was initially released. It's a fully functioning hard drive that is the size of a Compact Flash card. The Microdrive is extremely popular with the digital camera crowd, and is available in sizes up to 4GB.

Chapter Seven

Videocards

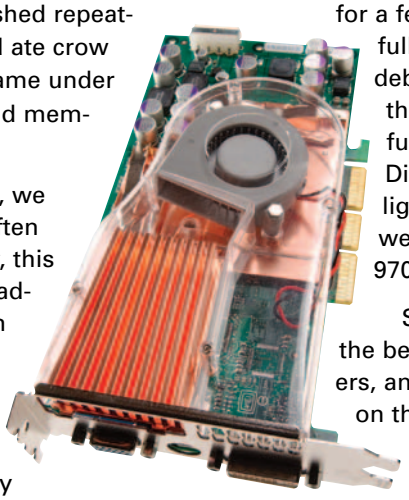
The ATI and nVidia videocard war escalated in 2004.



For many gamers, and for our Lab, ATI's Radeon 9800 XT was the video card of 2003—and beyond. Its extensive pixel shader capabilities and 8-pixel pipeline, which made for high-quality visuals and speedy performance, made it the darling of the game programming community.

The 3D videocard market is a rough one. Just ask employees of nVidia and ATI; over the course of the last year, the two companies clashed repeatedly in one showdown after another and ate crow as their products and marketing plans came under considerable fire from PC enthusiasts and members of the press.

Looking back over the last 12 months, we were surprised at how much and how often nVidia dominated the headlines. Usually, this is a good thing. More often than not, headlines tend to mean favorable coverage in the print and online hardware-oriented media outlets. Unfortunately for the Santa Clara–based hardware manufacturer, this was not the case. From July 2003 to June 2004, nVidia was repeatedly and publicly spanked. The company was forced to respond to several different negative allegations surrounding its videocards.



We were astonished at the size of the GeForce FX 5800. The card ran so hot it required an extensive—and quite cumbersome—cooling vent.

Amazingly, nVidia emerged from the continuous scalding it received with its reputation virtually intact. The summer 2004 release of the brand new GeForce 6800 finally merited the company some positive ink, and positioned nVidia's NV40 graphics chipset as the performance leader for the rest of the year.

ATI, on the other hand, started the year in much better shape than it ended. While remaining a favorite of the game development community, the company missed a huge marketing opportunity when *Half-Life 2* missed its release date on two separate occasions. Compounding this was the fact that R420, ATI's new GPU, wasn't expected to debut until long after nVidia's NV40-based GeForce 6800 was released.

> ***FROM JULY 2003 TO JUNE 2004, NVIDIA WAS REPEATEDLY AND PUBLICLY SPANKED.***

Round 1: ATI Trumps nVidia

As we entered mid-summer 2003, ATI rested on top of the 3D videocard world. The company was flush with the success of the revolutionary Radeon 9700, which was the first DirectX 9 videocard on the market. Built upon the company's R300 graphics chipset, the Radeon 9700 immediately won the hearts of gamers and members of the game development community for a few reasons. First, it was released a full three months before DirectX 9 even debuted. Second, it was DirectX 9–only; the card internally converted legacy functions and rendering types into DirectX 9. Finally, the video card was lightning fast—at the time of its release, we were blown away by the Radeon 9700 Pro's performance.

So, when ATI released the 9800 Pro at the beginning of the summer, gamers, writers, and editors all got hyper-excited. Based on the R360 graphics chip and sporting superior shader operations *and* a superior 8-pixel pipeline, it was clear to us—and the rest of the gaming- and hardware-oriented press—that the 9800 was superior to nVidia's GeForce FX 5800.

The primary advantage, we declared, was the 9800's wider memory pipeline. "In any benchmark that's memory-bandwidth intensive, such as *Dungeon Siege* at high res with anti-aliasing and anisotropic filtering enabled," we said, "the ATI card has a definitive lead over the nVidia card." This, we indicated, would give ATI a clear advantage in both today's games and the increasingly complex games that would be released in 2004. This performance existed despite the fact that this high-powered vid card was still based on a larger and therefore less efficient 150nm fabrication process!

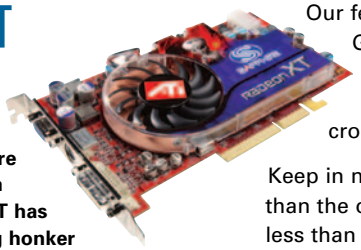
The Radeon 9800 XT had one other interesting feature: automatic overclocking, courtesy of the card's built-in Overdrive feature. This is a unique, automatic technology that uses variables such as GPU load and core/case temperature to actively adjust the core GPU's clock speeds, and overclock it under certain favorable circumstances.

But Where's Half-Life 2?

As impressive as the reaction to the Radeon 9800 was, ATI's image was slightly tarnished by the tragic events of September 30, 2003. Promoted for a month

MAXIMUM PC KICK ASS PRODUCT

Sapphire Radeon 9800 XT



The Sapphire Radeon 9800 XT has one big honker of a heatsink, but it still only fills a single slot.

Never let it be said that there's no choice among high-end 3D accelerators. The fact is, you can have a Radeon 9800 XT made by Sapphire or you can have a Radeon 9800 XT made by ATI. The Sapphire Radeon 9800 XT is essentially the exact same board as the ATI version of the 9800 XT. It runs the exact same clock speeds—412MHz core and 365MHz memory. It's got the same 256MB of DDR SDRAM, and the same big, copper heatsink that the stock Radeon 9800 XT sports. Unsurprisingly, it performs exactly the same as our stock ATI Radeon 9800 XT.

Where does this leave the gamer with $500 burning a hole in his pocket? With two options, actually: Shell out the big bucks for a premium card now, or wait until next spring when truly next-generation parts will be available from both ATI and nVidia.

Don't get us wrong: The Sapphire card is extremely fast and performs well in currently available games like *Deus Ex: Invisible War* and *Star Wars: Knights of the Old Republic*. We were able to run *KOTOR* at 1600x1200 with 4x antialiasing and 8x anisotropic filtering enabled without any frame rate problems at all. Like other Radeon 9800 series cards, image quality is top-notch. The Catalyst 3.9 drivers we tested the board with are rock solid, and are even slightly faster than the previous versions.

Our fear is only that we'll see newer, more capable GPUs this spring in the form of nVidia's NV40 and ATI's R420, and that these new chipsets will be significantly faster than the current crop in every category.

Keep in mind that this board is not significantly faster than the original Radeon 9800 Pro. In most tests, we see less than a 10 percent performance increase. The only real difference between the 9800 XT series of boards and the original 9800 is the new copper heatsink and the new Overdrive feature, which, when enabled, allows the videocard driver to slightly overclock the videocard when it's running cool. As soon as things heat up, the core clock speed is ratcheted back down. It's interesting technology, but the performance benefit is minimal at best because of the low maximum clock speed that ATI caps it at.

If your gaming performance is crippled by a two-year-old videocard, you won't be disappointed with the Sapphire card. However, gamers already running cards based on the R300 or NV30 chipsets would be better served by waiting for next spring's new GPUs.

Originally published February 2004

MAXIMUM PC VERDICT 9

DIAMOND

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CUBIC ZIRCONIUM

Next-gen GPUs are just around the corner.

$500, www.saphiretech.com

beforehand, this night was supposed to mark the debut of the most anticipated PC game of the decade—*Half-Life 2*. To celebrate the occasion, which would serve to heighten the effect of the official launch of the new and improved version of the 9800 Pro, the Radeon 9800 XT, ATI reserved Alcatraz Island for a private party and announced that everyone in attendance would receive a copy of the game.

Alas, weeks before the party, Valve Software, the game's developer, announced that the game would not ship on time. D'oh! Everyone—ATI, gamers, and the press—was sorely disappointed. Many chose to skip the event, which tarnished the 9800 XT's sterling reputation.

ATI's marketing woes ran deeper than the disappointing island party. Inside the Radeon 9800 XT box was a coupon that, when redeemed, would net the owner a boxed copy of *Half-Life 2*. Double D'oh! It would take more than a year before gamers could finally redeem their coupons. By then, ATI would have already announced its next generation graphics chipset—the R420—and its next videocard: the X800.

But at least ATI had a quality videocard in its pocket. This stood in stark contrast to the problems nVidia faced with the disastrous launch of the company's new GeForce FX 5800.

Round 2: nVidia Misses the Mark

Months before the *Half-Life 2* disappointment, just as the *Maximum PC* Lab was getting excited over the speedy performance of ATI's Radeon 9800 Pro, nVidia dropped a big, stinky bomb

of a videocard on gamers in the form of the GeForce FX 5800.

Delayed for months, the card's timing couldn't have been worse. Because it was released at the same time as the 9800 Pro, the two cards were repeatedly compared to each other on the Internet and in print magazines.

The FX 5800 was the first card based on nVidia's NV30 graphics chipset. Consumers who had eagerly pre-ordered it months prior found themselves gaping at the oversized, two-slot monstrosity they received in the mail. The GeForce FX 5800 was so big because of its elaborate cooling system. The core temperatures on the new 3D card ran so hot that the FX 5800 had to use a massive, noisy fan and a huge vent to exhaust the hot air. Additionally, just like ATI's 9700 cards and up, the card was such a power hog that you had to actually plug it into your motherboard.

In its defense, the FX 5800 did add full DirectX 9 support, including programmable shaders that conformed to the Pixel Shader 2.0 spec. And the core GPU was fast—it ran at 500MHz.

Ultimately, however, the card failed to meet the public's performance expectations, which had been considerably heightened thanks to ATI's release of the 9800 XT. Our Lab tests were equally disappointing. The FX 5800 performed admirably at our *Quake III* test when running with 2x anti-aliasing (AA) and 8x anisotropic filtering enabled, but when we nudged the AA up to 4x, it couldn't compete with Radeon's faster memory pipeline. Adding insult to injury, we determined that the Radeon 9800 actually looked better, too.

What's Up with DirectX?

Increased pixel-shading capabilities make DirectX 9 a star, but don't hold your breath for DX10.

Say what you will about Microsoft, but the company's gigantic push in 1995 and 1996 to launch DirectX has made the PC a much more hospitable platform for gaming. The company created this set of low-level APIs in order to provide developers with direct access to hardware in the Windows OS. Years ago, in the realm of DOS-based gaming, game publishers also had direct access to hardware, but it was quite painful; the thousands of different devices made for numerous compatibility issues. Windows 3.1 wasn't any better; in fact, it was even more complicated.

***Half-Life 2* will maximize its usage of DirectX 9 effects. The end result: a plush, vibrant game world.**

So what's going on with DirectX now? Not a whole lot, but that's not necessarily a bad thing because DirectX 9 has made for some pretty spectacular results in terms of 3D gaming.

The key advance in the DX9 version of Direct3D, the driver that handles 3D rendering, is the presence of Pixel Shader 3.0, which provides an unprecedented level of graphical quality and performance, including smoother levels of detail on up-close objects, an increased level of detail on far-away textures, and more realistic shadows.

Additionally, DirectX 9 is much more accessible to developers; the implementation of higher level shading language (HLSL) allowed a wider array of programmers to implement sophisticated shaders using a more familiar, procedural programming paradigm. This meant that, over the course of the last year, gamers have been able to see more DirectX 9 games faster than they did after the release of DirectX 8 and DirectX 7.

So what's on the horizon? Not much, and not anytime soon. DirectX 9 is so advanced and so future-proof that we don't expect to see a new version of it until the next version of Windows (code name Longhorn) is released in 2006.

That's okay, because it will be at least two years before DX9 games begin to look dated.

"One card is fast but noisy. The second card is faster and not noisy," we stated in the June issue. The choice between the two cards was clear: The Radeon 9800 Pro was easily the winner.

In response to this negative wave of press, nVidia retreated, licked its wounds, and quickly announced and released the GeForce FX 5900, a much more impressive video card that delivered much more impressive results. But nVidia's problems were far from over...

nVidia Atones for Its Sins, But . . .

Bruised but undeterred by the negative press surrounding NV30 and the FX 5800, nVidia went back to the drawing board and made drastic improvements to their GPU. In July, the company released the fruits of their hastily applied labor: the GeForce FX 5900 Ultra. The new videocard was powered by the NV35 core, which was an upgraded version of the NV30.

Although the double-wide 256-bit memory interface (NV30 only had a 128-bit memory interface) was responsible for most of the NV35's performance gains, the new core included several other enhancements. New shadow-rendering techniques maximized performance by running the complex math calculations to draw shadows only in areas where it was physically possible for shadows to be. nVidia also improved many of the image quality problems we experienced with the 5800 boards.

Furthermore, the upgrade in memory bandwidth allowed nVidia to notch down the 5900's clock speeds, resulting in less heat being generated. Unfortunately, the card still used the double-wide, honking big heat vent.

The end results were good; it appeared that nVidia had atoned for its sins. We thought so highly of the FX 5900 Ultra that we gave the card great reviews and even selected it to appear in the high-end videocard category of "Best of the Best," our monthly picks. The card had pulled into an even tie with ATI's Radeon 9800, but the card's inefficiencies would soon become a glaring public weakness.

Half-Life 2 nVidia Brouhaha

On September 10, Gabe Newell, founder and chief executive officer of Valve Software, developer of *Half-Life 2*, gave a PowerPoint presentation at an ATI event named "Shader Day" that further undermined the image of nVidia and the FX 5900 Ultra.

PNY Verto GeForce FX 5950 Ultra

Another nVidia card, another new heatsink design. This one is a bit louder than the 5900 design, but is an extremely effective cooler.

The Verto is the first board we've tested based on nVidia's GeForce FX 5950 Ultra chipset. It's essentially the same videocard as the original 5900 with slightly faster clock speeds and a dollop of secret sauce.

The secret sauce takes the form of 52.16 drivers. The new drivers include a compiler that grabs shader code that ran poorly on the GeForce FX GPU and rearranges key functions so as to use the hardware more efficiently. This should help address an issue we first reported in November 2003—a speed deficiency that occurred when GeForce FX hardware ran DirectX 9 games such as *Halo*, *Tomb Raider: Angel of Darkness*, and *Half-Life 2*.

nVidia claims these optimizations have zero impact on image quality. To test this, we did side-by-side comparisons between this Verto board and the Radeon 9800 XT (reviewed last month), using every available DirectX 9 game. We were unable to discern any shader inconsistencies between the two, and visual quality with the Verto was as good as or better than that of the GeForce FX 5900 with the older 4x series of drivers, in all the games we tested.

The Verto's benchmark performance was neck and neck with the Radeon 9800 XT. The former's 475MHz DDR-II memory gives it significantly more memory bandwidth than the 9800 XT, resulting in a slight advantage in fill-rate limited games. The new drivers and faster 475MHz core also allowed the Verto to overtake the Radeon in shader-limited apps. It's worth emphasizing that the two boards were extremely close in every benchmark we ran. In fact, the cards scored so closely, they're within the margin of error in several of the benchmarks we use.

The real problem with this card is that it features the third revision of a chip that has only been on the market since June. Given the recent delays of two high-profile programmable shader games—*Half-Life 2* and *Doom 3*—it just doesn't make a whole lot of sense to buy an NV30 or R300 generation product.

Originally published January 2004

MAXIMUM PC VERDICT 9

DR. PEPPER

Damn fast, and the problems with programmable shaders seem to be a thing of the past.

MR. PIBB

When the next-gen parts from nVidia and ATI hit in the spring, this card is going to be obsolete.

$500, www.pny.com

Newell began his presentation innocently enough, by proclaiming that he saw *Half-Life 2* as "as a new benchmark for the type of amazing experiences that can be delivered on the Windows platform." The game, he declared, would make such effective use of DirectX 9 functionality, including shaders, bump-mapped characters and environments, and soft shadows, that it would be far ahead of the technology curve compared to most other games scheduled for release in late 2003 and much of 2004.

He then went on to ignite yet another firestorm of online commentary regarding 3D card performance when he slammed nVidia's GeForce FX 5900 for requiring a large amount of additional effort to get the cards to play the game at acceptable speeds with DX9 effects enabled. Initially, he indicated, the FX 5900 was displaying a vastly inferior 30 frames per second in the game. Valve boosted the frame rate to 50fps by working with nVidia to create a special "mixed" mode that used 16-bit precision instead of 32-bit precision for certain floats, and defaulted to Pixel Shader 1.4 shaders (found in DX8.1) instead of newer Pixel Shader 2.0 (DX9) shaders.

nVidia's lower-end cards, the 5200 and 5600, were only capable of generating 10 to 15 frames per second. In marked contrast, without much tweaking, ATI's Radeon 9800 Pro played *Half-Life 2* at 60fps.

Because of ATI and Valve's partnership, Newell felt it necessary to defend his company's findings from people who thought ATI's OEM deal with Valve was the real reason for the benchmarks. The reality, Newell explained, was that these results were the reason they had an OEM deal with ATI. He went on to challenge the audience to ask Microsoft if "they think we have cooked these numbers or failed to invest in optimizations for all hardware."

Based on nVidia's fast new NV40 graphics processor, the GeForce 6800 was the first "next-gen" videocard to hit the market in 2004. This 3D card atoned for the sins of its predecessor, the GeForce FX 5800.

Newell closed his presentation by stating, "We have and will continue to have marketing and development activities with companies that we think are in the best interest of our customers."

His comments ignited a massive firestorm of controversy and online commentary. nVidia addressed the issue in a public statement issued 24 hours later. Here are some excerpts from that press release:

> "Over the last 24 hours, there has been quite a bit of controversy over comments made by Gabe Newell of Valve at ATI's Shader Day. During the entire development of *Half-Life 2*, NVIDIA has had close technical contact with Valve regarding the game. However, Valve has not made us aware of the issues Gabe discussed…"
>
> "We're confused as to why Valve chose to use Rel.45—because up to two weeks prior to the Shader Day we had been working closely with Valve to ensure that Rel.50 provides the best experience possible on NVIDIA hardware…"
>
> "…Since we know that obtaining the best pixel shader performance out of GeForce FX GPUs currently requires some specialized work, our developer technology team works very closely with game developers to help them with this. Part of this is understanding that in many cases promoting PS 1.4 (DX8) to PS 2.0 (DX9) provides no image quality benefit."
>
> "…The optimal code path for ATI and NVIDIA GPUs is different, so trying to test them with the same code path will always disadvantage one or the other…"

nVidia's response did little to placate ATI (and *Half-Life 2*) fanboys, but it—and the game's delayed release—allowed nVidia to dodge a potentially destructive bullet. Had *Half-Life 2* been released on time in September 2003, and Gabe Newell's allegations proved true, this brouhaha might have severely damaged nVidia's credibility.

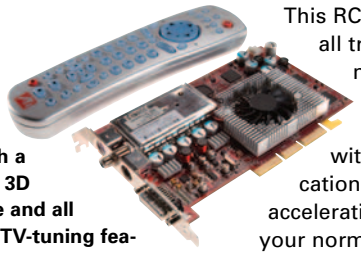
But because of the ship date delay, all the concerns about nVidia's 3D performance simply

THE WHOLE HALF-LIFE 2 EVENT WAS THE 3D SCENE'S ALTAMOUNT. IT WAS THE MOMENT EVERYONE LOOKED AROUND AND SAID, 'SOMETHING'S NOT RIGHT HERE.'

—WILL SMITH, TECHNICAL EDITOR

ATI All-in-Wonder 9800 Pro

ATI has long proclaimed that the All-in-Wonder is the perfect union of best-in-class 3D acceleration and all the TV-tuner features one would ever need for TiVo-style television recording and low-level video editing. The latest version of the "AiW" makes good on these promises, and is definitely the best version yet, but it's still missing one or two features we'd really like to see.



With a fast 3D core and all the TV-tuning features of previous All-in-Wonders, the 9800 Pro is perfect for a home theater PC.

Performance is on par with the initial 128MB version of the Radeon 9800 Pro, which isn't surprising because this AiW runs the same 380MHz core and 330MHz DDR memory as that board. We were surprised to see that the 128MB All-in-Wonder was slightly faster in many cases than the 256MB Radeon 9800 Pro. We think the speed increase can be partly attributed to a driver update: We tested the AiW with a final Catalyst 3.4 driver, which wasn't available when we tested the 256MB 9800 Pro. It's also possible that the 256MB Radeon 9800 Pro suffers a bit of lag in its memory controller, which has to address twice as much memory as the latest AiW.

In addition to its obvious role as a gaming card, the new AiW is well-suited to take the center seat in a home theater PC. The latest revision of the bundle includes the same awesome remote control that shipped with the 9700. This RC includes a directional pad that easily handles all traditional mousing duties, and has controls for most of the common tasks you'd need while couch surfing. You can start your web browser and TV- and DVD-viewing programs with a single button press, and every other application on your PC is accessible as well. Speed and acceleration for the mouse cursor are independent of your normal mouse, so you can use the mouse integrated in the remote for most entertainment-related activities, and also keep a standard mouse for gaming or anything else that requires high precision.

Image quality in 3D games is up to ATI's usual high standards, and the quality of TV images is excellent as well. You'll see none of the washed-out TV colors that plagued earlier versions of the AiW. The real-time encoder that the AiW uses to provide PVR capabilities produces MPEG video files that are crisp and clear, too.

Originally reviewed July 2003

MAXIMUM PC VERDICT

All-in-Wonder 9800 Pro

ATI

+ THE SEVENTH GUEST

Fast 3D acceleration, a great TV tuner, a fully functional remote control, and software to tie the whole package together make this a sure winner.

– MYST

It's not the fastest 3D accelerator anymore, and we're anxiously awaiting hardware that will let us control our cable boxes.

www.ati.com

$450

9

vanished. In the extremely volatile, rapidly changing waters of the 3D market, nVidia got extremely lucky.

nVidia and ATI Release Fast New Cards

Just after the midpoint of 2004, however, nVidia finally atoned for *all* its sins in one fell swoop. The moment the company released the ultra-fast, ultra-powerful GeForce 6800, it immediately recaptured the public's attention.

The GeForce 6800 was the first videocard on the market powered by nVidia's new NV40, and tests revealed that it performed significantly faster than ATI's Radeon 9800 XT.

The biggest enhancement in NV40 was an increased number of pixel pipelines. Each pixel that's drawn on your screen passes through a pixel pipeline, which in most cases, works its mojo on a single pixel every clock cycle, although more complex effects sometimes require multiple passes through the pipeline. Pixel pipeline performance is the limiting factor, the bottleneck of sorts, for 3D applications like games.

Because nVidia equipped the NV40 with an astonishing and unprecedented 16 pipelines, the GeForce 6800 exhibited better performance than its predecessors and the competition. Sixteen pipelines is *double* the number of pipelines in ATI's Radeon 9800, and four times the number of pipelines in the GeForce FX 5950. Sweetening the pot, these weren't theoretical pipelines that only worked in certain circumstances. Each one is available all the time, and any 3D application or game can use them.

Shortly after nVidia sent us a sample of the GeForce 6800, ATI released its own next-gen video card. Based on the company's brand new R420 chipset, the X800 also sported 16 pipelines.

We got both cards into the *Maximum PC* Lab in mid-April. Upon testing them, technical editor and 3D card expert Will Smith was astonished at the frame rates each card exhibited in testing.

On many of the tests we ran, both the Radeon X800 XT and the GeForce 6800 Ultra ran twice as fast as the Radeon 9800 XT—the fastest card of the previous generation!

Despite the slower core clock speed, the nVidia card boasted a few advantages. With slightly more memory bandwidth and an additional pixel shader unit in each pipeline, the GeForce 6800 purred through tests that emphasized shadow volumes. Also known as stencil shadows, nVidia added the extra pixel units to greatly accelerate this effect. An example of a game that utilizes this 3D effect is *Doom 3*, which uses volume shadows to render the amazingly realistic shadows you've seen in screenshots. Coincidentally, *3DMark2003* Game 2 also makes extensive use of volume shadows. The GeForce 6800 Ultra's domination of the new Radeon in Game 2 led us to believe it will be the best card for *Doom 3*.

Looking at the rest of the benchmark results, however, the situation isn't as cut and dried. Although the X800 does win most of the real-world tests—we'll talk about *Halo* in a second—it wins by just a few percentage points. In *Far Cry,* which makes the heaviest use of programmable shader technology that we've seen to date, the cards ran within four frames per second of each other, even with the water reflections set to the Pixel Shader 2.0 Ultra-High mode instead of the Pixel Shader 1.3 fallback mode.

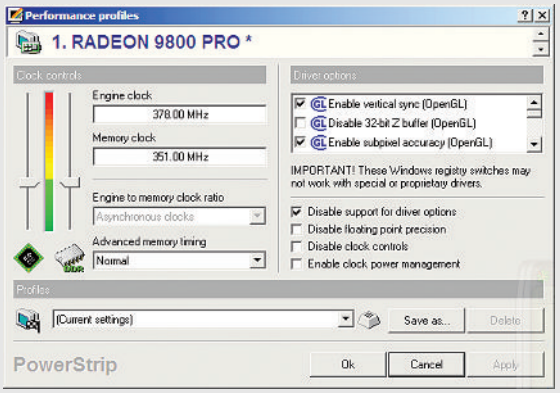
While the Radeon X800 XT Platinum supports 24-bit floating point color throughout the pipeline, which is all that's required for Pixel Shader 2.0 support, this falls short of the 32-point FP support that the Pixel Shader 3.0 spec requires. While we're not convinced that Pixel Shader 3.0 will be as prevalent as nVidia—which

Videocard Overclocking

Looking for a little extra gaming performance? It's easier than ever to overclock your 3D card.

It's the inevitable bite of the backside of the technology curve. As games get more powerful, our videocards feel weaker and weaker. This is especially the case during the dead three or four months at the end of a formerly new product's lifecycle, a time when we're eagerly awaiting new GPU technologies such as nVidia's NV40 or ATI's R420.

Thankfully, you don't have to stand pat. In increasing numbers, gamers and hardware enthusiasts have turned an excited eye toward overclocking. Formerly a mysterious and high-risk practice, the technology has recently become so accessible that anyone can do it. The key is to make sure you have decent cooling in your PC case—if the heat generated by your overclocking doesn't get cooled down, you could be headed for an expensive videocard meltdown.



***PowerStrip* makes overclocking your videocard as easy as moving one, two, or both of the sliders on the left side of this screenshot. So what's your excuse now?**

Here's how to do it. But first, a warning: Overclocking voids your warranty, but if you follow our instructions, there's only minimal risk of damage to your hardware.

- First, download and install PowerStrip. You can get it from www.entechtaiwan.com.
- Right-click PowerStrip's tray icon, and select Performance Profiles, then Configure.
- You should see something that looks like the image included here. Two vertical sliders will be on the left side of the Performance Profiles window. The slider on the left controls your card's core speed, and the slider on the right controls the card's memory speed.
- Increase the core speed in 2MHz increments. After each increase, test the card's stability by playing a 3D game or running a benchmark. Repeat until you start seeing rendering errors during your testing, then crank the core clock back down until the card is stable.
- Increase the memory clock in the same slow increments, making sure to test between each increase.
- Enjoy your new, faster frame rates!

How We Test Videocards

Testing a videocard is as simple as installing the card and running a few games, right? Wrong! Not only do you need to measure every aspect of a card's performance, but you also need to consider other important factors like image quality, stability, and sundry intangibles. To test every aspect of a card's performance, we use a combination of commercial benchmark programs, games with built-in benchmarks, and homegrown benchmarks using *Fraps* or another frame-counter program. We also perform extensive play testing with each card using a library of at least 10 titles, which range from new releases to the classic games that thousands of people still play. Finally, we look at a few scenes we're intimately familiar with to qualitatively measure anti-aliasing quality, anisotropic filtering quality, and overall image quality. To assign a verdict to a product, we factor in benchmark performance scores, stability, and image quality.

Here's a look at the benchmarks we run:

Unreal Tournament 2003
Unreal Tournament 2003's flyby benchmark has been a staple in our testing suite since the game came out. Unlike the botmatch mode—which is limited by CPU performance—the flyby is an excellent indicator of basic videocard performance. We run the flyby at 1600x1200 at the default settings.

Far Cry
Far Cry is the first game we've tested that stresses programmable pixel and vertex shader performance. To hammer the shaders we set everything to Very High in the Advanced Graphics control panel, then we crank the water quality to Ultra High, which enables more complex fully reflective water. Because *Far Cry*'s integrated demo mode doesn't actually record enemy movement, we use *Fraps*—a third-party frame rate counting utility—to measure the frame rate. To ensure we get identical results, we load a specific save-game, and measure the frame rate with *Fraps* for 35 seconds while we walk straight ahead in the game. We test *Far Cry* at 1280x1024.

3DMark2003 version 340
We report several numbers from *3DMark2003*, including the overall composite score using default settings, the Game 2 and Game 4 results at 1600x1200, and the Pixel Shader 2.0 test at 1600x1200. Game 4 is a great indicator of overall pixel and vertex shader performance, while Game 2 uses volume shadows—the same technique that *Doom 3* uses to render realistic shadows. The *3DMark2003* results we report (with the exception of the overall score) give an indication of programmable shader performance.

Halo 1.02
Halo was one of the first games on the market that stressed programmable shader performance, and it includes a benchmark to boot! We run *Halo* at 1600x1200, and force Pixel Shader 2.0 mode on using a command-line switch.

Aquamark 3
Aquamark 3 is another synthetic test that measures a combination of your videocard's available memory bandwidth and the prowess of your card's programmable shaders. We test *Aquamark 3* using the default settings.

single-handedly pushed the spec—would like us to believe, particularly over the next 12 months, this is still a ding against ATI. It essentially makes the card less future-proof.

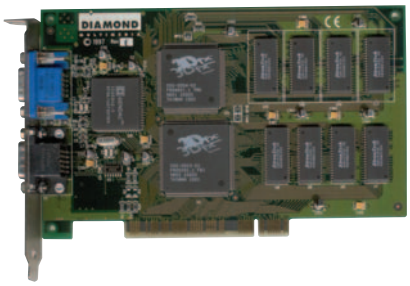
Unfortunately, just like nVidia's last generation's NV30-based series of cards, the GeForce 6800 Ultra's large, hot core requires a special two-slot cooling solution. This time around, however, nVidia is requiring *two* power connectors from your power supply. Additionally, the 6800 requires a monster 380W power supply. This means that in addition to the $500 this card will cost you, you may also have to shell out another $60–$150 for a new PSU.

To test the next-gen cards, we used every game we could get our hands on that uses programmable shaders. Now that we finally have some next-gen titles that use DirectX 9 programmable shaders, we'll be damned if we don't put them to use. We tailored our tests to be equal parts real-world performance measurements and synthetic benchmarks.

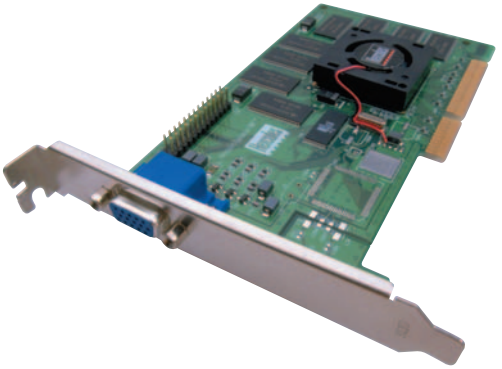
Our benchmarks were the standard *Halo* time demo at 1600x1200, *Far Cry* at 1280x1024 (Very High quality with water set to Ultra High), *Unreal Tournament 2003* Demo v. 2006 Flyby at 1600x1200, *Aquamark3* default settings, *3DMark2003* default settings, and *3DMark2003*'s Pixel Shader 2.0 test. For games that don't include a benchmark utility, we used *Fraps* (a third-party frame rate counter) and tested the frame rate while we walked forward in-game for a minimum of 35 seconds.

So, which videocard did we like better? At press time, we chose ATI's Radeon X800 XT. Its smaller size and "normal" power requirements were the deciding factor in what was otherwise a performance stalemate. Talk about close calls!

The Five Most Important Videocards of All Time

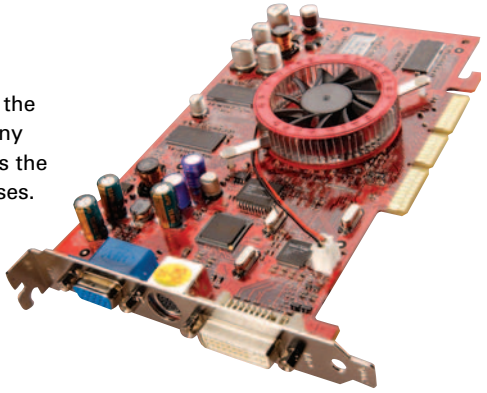


Voodoo 1: Created by 3Dfx, the Voodoo 1 was the first *real* 3D graphics card. *GLQuake*, the first *real* 3D app for the first 3D card, blew us away with its water effects and mesmerizing textures. This card, which was 3D only and required the use of a separate 2D card, gave us a huge hint of 3D goodness to come.

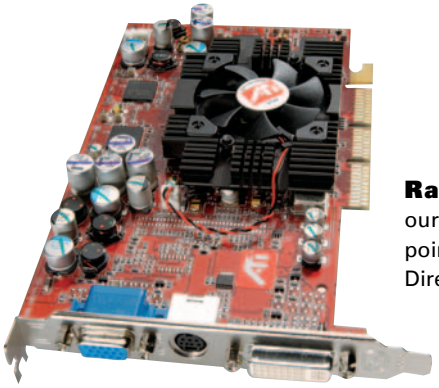


Riva TNT: This classic 3D videocard put nVidia on the map by providing gamers with the allure of 1024x768, 32-bit color gaming. Sure, no games supported 32-bit color when this card came out, but hey—*Maximum PC*'s motto is "pure PC power." We drooled over it.

GeForce 3: Another nVidia card, the GeForce 3 was criminally underpowered by today's standards, but at the time, its register combiner technology was used to create realistic reflections and bumpmaps on surfaces in games.



GeForce 4 Ti 4200: The fact that nVidia created three of the five most important cards of all time makes the woes the company suffered in 2003–2004 more appalling. The GeForce 4 Ti 4200 was the card that brought DirectX 8.1 programmable shaders to the masses. On top of that, it was one heck of an overclocking board as well.



Radeon 9700 Pro: The most recently released card on our list, ATI's Radeon 9700 was the first card to support floating point color—even if it was only 24-bit—and also support DirectX 9's fully programmable shaders.

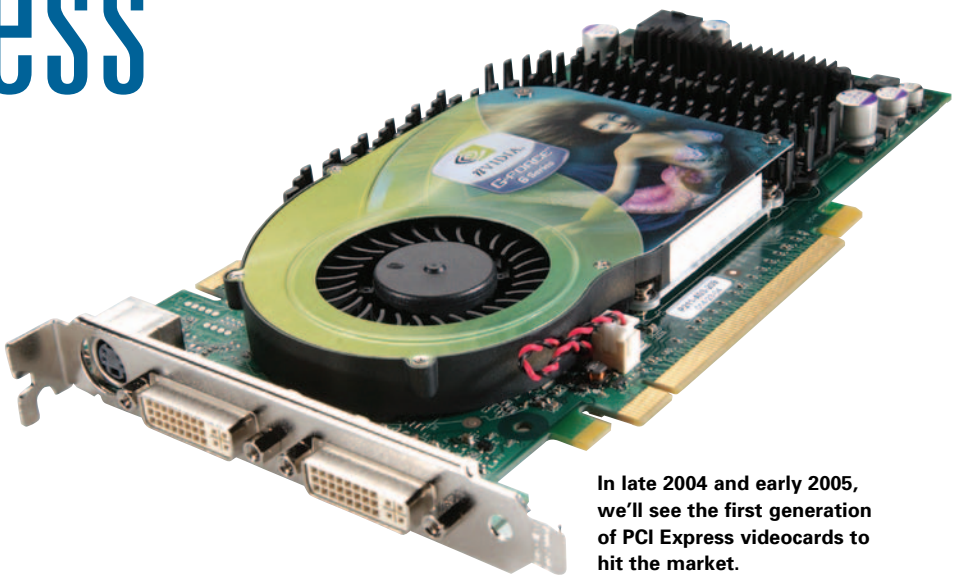
Looking Ahead: PCI Express

Now that ATI and nVidia have released their newest videocard technologies for the year, what can consumers expect? A whole lot, as it turns out.

With both ATI and nVidia having already broken out the big guns, the paths for both companies' 3D future plans are clear and can best be described with the initials and a single word: PCI Express.

PCI Express is planned as an evolutionary replacement for the years-old PCI standard, which has been in place since the early '90s. In short, PCI Express is a two-way serial connection that carries data in packets, similar to the way data is transferred via an Ethernet connection. A special version of the standard named X16 PCI Express that will replace AGP 8x is currently in the final stages of development. In a year or two, this standard will probably have completely supplanted AGP as the platform of choice for graphics card manufacturers.

Both nVidia and ATI have officially announced plans to release PCI-Express versions of their cards later this year. Both companies are also developing new chipsets for this new standard—the NV45 and the R423, respectively—that should be shipping by the time you read this. We can't wait to get them in for testing.



In late 2004 and early 2005, we'll see the first generation of PCI Express videocards to hit the market.

Interestingly, NV45 will not be a native PCI Express part. Instead of integrating the silicon necessary to talk to the high-speed PCI Express bus into the GPU itself, nVidia uses a bridge chip. nVidia claims the bridge—dubbed the high speed interconnect (HSI)—is equivalent to a fully bidirectional AGP 16x connection and will perform no worse than a native PCI Express graphics card. Frankly, we're skeptical of claims that no performance degradation will result from using the bridge instead of a native solution. It just doesn't jibe with our experiences with other bridge technologies. Time will tell.

What's Alienware Doing?

In May 2004, Alienware dropped big news on the hardware community.

The company announced plans to boost 3D graphics performance by an astonishing 50 to 70 percent. We were initially skeptical of these claims; an early May meeting with Alienware's engineers changed our mind.

The company's solution was elegant, albeit pricey. In an effort to

"BOTH ATI AND NVIDIA'S FUTURE PLANS CAN BE SUMMED UP WITH ONE TERM: PCI EXPRESS."
—WILL SMITH, TECHNICAL EDITOR

distinguish the performance of its systems, Alienware custom-designed a motherboard that allows two PCI Express videocards in addition to dual CPUs. Two next-gen videocards work together in this rig; a proprietary hardware/software solution takes the video output of each card and merges them together.

Alienware told us that they would establish a new high-end label under which these new systems would be sold. Named ALX, this brand will feature a high-powered (and possibly even dual) power supply, top-notch cooling, and a special case enclosure.

Not to be outshone, in the middle of the summer, nVidia announced a dual-card SLI solution of their own. Based on PCI Express, the company's dual-card approach will use a silicon connector to connect two GeForce 6800s. It's not clear how this approach will impact Alienware's plans.

Whatever Happened to . . . 3Dfx?

For several years, this 3D card manufacturer was on top of the world, until hubris and bad decision-making got the best of them. Here's how it went down.

3Dfx leapt to fame in 1996 when the company released its Voodoo graphics chipset. Despite being an add-on card—you had to actually connect it to an existing 2D card—the company's first 3D card became popular with gamers looking to amplify their gaming experiences. It's arguable that the Voodoo 1 was the high point of the company; by offering significantly better performance than competing products, 3Dfx made their mark and established a high quality reputation. For other gamers, however, the Voodoo 2 was the high point. Its SLI capabilities, which allowed two cards to be linked together for double the performance, were way ahead of its time.

In August 1997, 3Dfx released the Voodoo Rush, which integrated the Voodoo chipset with a 2D card built by a third party. Rather than provide the best of both worlds, this card actually provided the worst of both worlds, with poor 3D performance and poor quality 2D visuals.

Voodoo 2 redeemed the company. Released in 1998, this card had a wider memory bus and faster clock speeds. It also had the ability to operate in a mode called Scan-Line Interleave mode (SLI), which allowed two boards to work together to double performance. Quite powerful, this videocard also carried a hefty price tag because it required three separate chips, whereas competing products from ATI and nVidia combined 2D and 3D functions into a single chip.

3Dfx pioneered the practice of aggressively reaching out to the game development community. In 1999 at the Electronic Entertainment Expo in Los Angeles, the 3Dfx logo was literally everywhere. It seemed like 75% of all the booths at the show were using the company's new Voodoo 3 videocard.

So what happened? Shortly after 2001, 3Dfx decided to purchase STB Technologies, one of the biggest graphics card manufacturers at the time. 3Dfx's plan was to make and sell cards on their own, rather than sell chips to other third-party manufacturers, a practice that companies like nVidia engaged in.

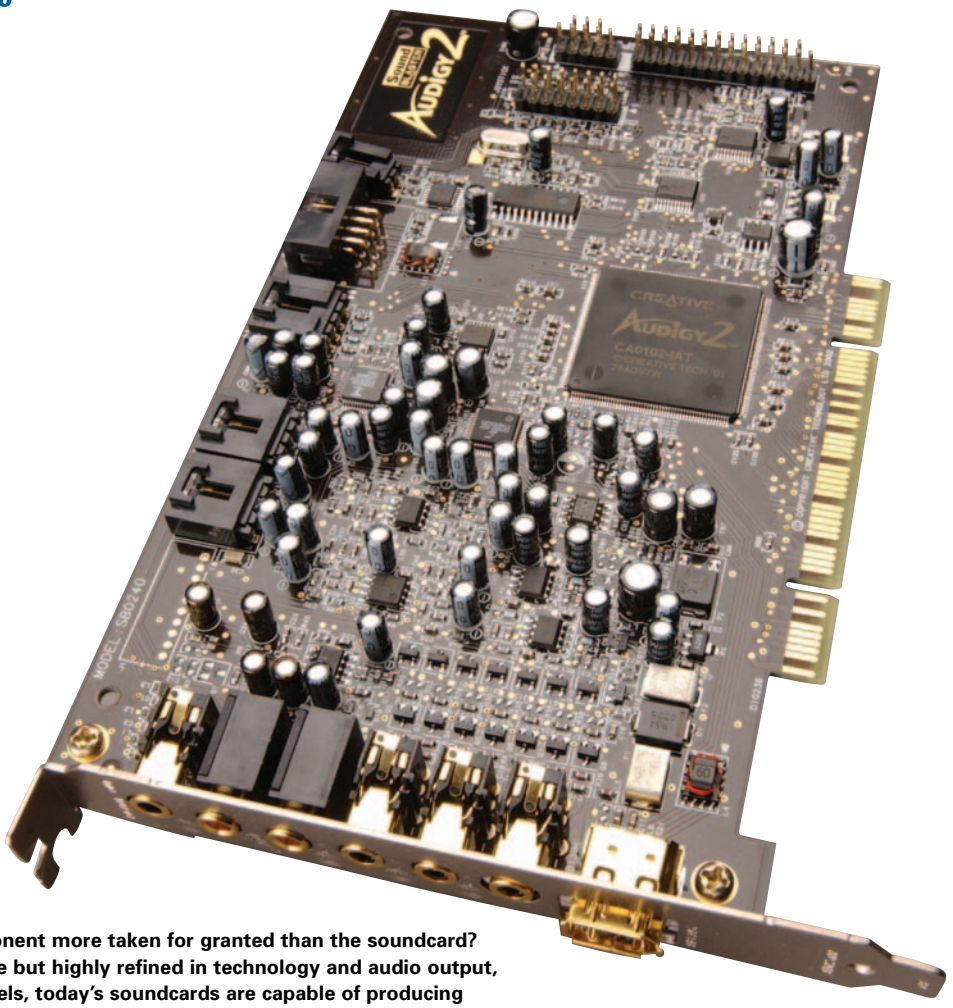
This decision, combined with the company's obsession with leading the market in technology, set the company's decline into motion. By ignoring the millions of low-end and mid-range gamers eagerly seeking 3D solutions, 3Dfx essentially conceded this larger, more lucrative market to nVidia and ATI.

Hemorrhaging money, 3Dfx shipped the Voodoo 4 extremely late and watched nVidia's offering outperform it. In the company's last sorry chapter, it failed to get its final product—the Voodoo 5 6000—to market before closing its doors.

Chapter Eight

Soundcards

Creative dominates the market, but could Intel's new onboard audio spec threaten its stranglehold?



Is any PC component more taken for granted than the soundcard? Simple in stature but highly refined in technology and audio output, at their base levels, today's soundcards are capable of producing lush, rich 24-bit sound over 8 different channels. That's a far cry from the beep, blip, and ker-splatz of yesteryear's Sound Blaster.

The soundcard market appears more genteel and evolved when compared to the rather volatile waters of the 3D card, CPU, and PC case enclosure categories. That's because, in some ways, it is. The generational leaps between soundcard technology don't occur as frequently as they do in other PC categories these days because, frankly, the existing technology sounds pretty darn good.

External soundcards offer laptop users the ability to hear high-quality audio while on the go. For reviews of two popular portable solutions, turn to page 110.

Ten years ago, however, soundcards didn't sound all that great, unless you compared them to the crude *beep-beep* of the PC speaker. Addressing this hole in the market is how Creative—the dominant soundcard manufacturer in the market—began to establish itself as the three-ton gorilla it currently is.

Creative is credited with revolutionizing multimedia computing in 1989, when it released the Sound Blaster, a PC sound card featuring an 11-voice FM synthesizer with text-to-speech, digitized voice input/output, and a joystick port.

Many companies followed in the wake left by Creative (then known as Creative Labs). Very few of these companies remain standing; the cause of this die-off is two-fold: Creative's popularity allowed the company to dominate the market, along with the rise in the quality of soundcards integrated directly onto motherboards. We'll explore the phenomenon of integrated sound in more detail later in this chapter.

How Can a Soundcard Make a Game Look Better?

There's a popular adage in the soundcard industry: If you show an audience a movie using a busted speaker running in mono, and then you show the same audience the exact same movie but with state-of-the-art-speakers and in surround sound, they're bound to say the second movie *looked* better. This parable highlights the quirky world of PC audio, which tends to be a perennial afterthought to concerns about megahertz, pixels, and gigabytes.

But PC audio has come a long way since its days of scratchy hiss. Today's PCs sing in full surround sound and can play full 24-bit audio, producing realistic audio that seems to be emanating from all sides. High-end soundcards typically support 5.1, 6.1, or 7.1 multichannel output. Here's a quick explanation of all the various output modes:

- **Two-channel**: Common stereo output with two speakers arranged in front of you, with one on each side of your monitor.
- **Four-channel**: PCs first adapted to "surround sound" by adding two speakers positioned to the left and right behind a user.
- **Five-channel**: To help fill the gaps, a center channel get positioned directly between the left and right front speakers. In most DVD movies, dialog is played through the center channel.
- **Six-channel**: A sixth speaker positioned directly behind the listener's head helps fill out the rear audio.
- **Seven-channel**: Although very few speakers support it, the 7.1 configuration adds two speakers behind you for even higher precision in distinguishing rear audio cues.

Although multichannel soundcards are common, the majority of PC users run 2 or 2.1 speakers, or even use headphones. Because of this, most soundcard vendors spend an inordinate amount of time trying to develop filtering algorithms that will fool you into believing that the audio from just two speakers is coming from behind you. It's an inexact science and the faux surround sound effect is bound to differ among individuals. So we don't recommend basing a soundcard purchase on "virtual" surround sound.

> ***"...WE DON'T RECOMMEND BASING A SOUNDCARD PURCHASE ON 'VIRTUAL' SURROUND SOUND."***

The most effective technique for most people is nothing less than full 4.1, 5.1, or better, with speakers positioned behind their heads.

Sound Blaster Audigy 2 ZS Platinum

After facing some minor 24-bit soundcard competition last summer (which has since all but fizzled out), Creative Labs could've easily settled into a simple holding pattern with its Sound Blaster Audigy 2, the company's top offering. But the recently released Audigy 2 ZS Platinum—while not a major upgrade—proves that Creative doesn't take its market dominance for granted.

Creative re-established its soundcard dominance with the release of the Audigy 2 ZS Platinum.

For example, the Audigy 2 offered 6.1 speaker support while its main competitors could accommodate 7.1 setups. And although the Audigy 2 offered awesome audio when using DVD-Audio, M-Audio's Revolution 7.1 had slightly better sound quality. And the Audigy wasn't quite capable of producing 24-bit on all its seven channels. The Audigy 2 ZS corrects these shortcomings with support for eight-channel audio sets, full 24-bit/96KHz audio on all its channels, and improved audio.

The Audigy 2 ZS sports the same digital audio converters as its predecessor, but Creative says the signal-to-noise ratio has gone from 106dB to 108dB in its newer card. Creative attributes the higher SNR to a redesign of the PCB and its consequent cleaner sound. We tend to believe the claims as our subjective listening tests of 24-bit/96KHz material favored the Audigy 2 ZS's sound quality over that of the once-superior Revolution 7.1 card.

The Audigy 2 ZS allows you to manage additional satellites via an applet that lets you fine tune the speakers while factoring in elements such as your head size. Also new: a THX tuning applet for proper THX support. In the hardware department, Creative now bundles the Platinum versions of its card with both black and white bezels, and the remote control has been redesigned.

Performance-wise, the Audigy 2 ZS continues to outperform non-DSP based cards such as the Revolution 7.1 in gaming frame-rate tests. Overall, Creative Labs has improved upon an already strong design. Sound Blaster Audigy or Audigy 2 owners needn't shell out for the update, but anyone still mired in the muddy waters of 16-bit audio would do well to buy the Audigy 2 ZS, and enter the 21st century.

Originally published January 2004

MAXIMUM PC VERDICT 9

SIGNAL-TO-NOISE

Excellent sound, great software bundle, DVD-Audio support.

NOISE-TO-SIGNAL

DVD-Audio lacks title support, not enough of an upgrade for Audigy 2 owners.

$400, www.creativelabs.com

Up Close: Today's Soundcards

At the core of today's high-quality soundcards is an audio processing unit that does the majority of the sound processing. Soundcards also can contain surround sound decoders, which separate digital sound streams from DVD movies into discrete channels, or analog sounds into separate channels for games. This is called "3D sound," or "positional audio," and a soundcard's ability in this arena is dictated by the hardware or software support for audio code specifically programmed into games. These different types of surround sound for games include Creative Labs's EAX and Microsoft's DirectSound3D (which we'll get into in about 300 words). Some soundcards even have specific optimization for MP3 playback.

The typical soundcard will usually contain a CD pass-through interface that allows the CD or DVD drive to be connected to the soundcard (usually with a thick gray cable) so that you can play music CDs through the system's speakers. Some devices provide dedicated support center/subwoofer channels; most audio hardware includes digital outputs, coaxial, optical, or both.

DirectSound, DirectSound3D, and the API Wars

It's difficult to discuss soundcards without dredging up the past. In the beginning, DOS-based video games, such as the original *Doom,* required that game developers write drivers for each videocard. Microsoft's DirectSound and DirectSound3D APIs let developers write to a common API (application programming interface) and not worry about the different soundcards.

But soundcard vendors, eager to differentiate themselves from each other, continued to develop their own APIs and features. Aureal's A3D was one of the strongest rebel APIs and garnered a fair amount of support from gaming developers, while Creative Labs pushed its own EAX API, which worked in conjunction with DirectX.

In the end, Creative's simpler API won out. Today, DirectSound3D and Creative's EAX are the prevailing APIs for games. EAX has also vastly improved with more subtle controls that affect how something sounds going through an object or reflecting off an object. When we test soundcards, we make sure they support DirectSound3D and some level of EAX; thankfully, these days the vast majority of soundcards do.

Integrated Onboard Audio Is Popular

Just as soundcards have evolved, so has the audio on motherboards. Years ago, motherboard makers simply bought audio chips, such as a Sound Blaster, to embed on their boards. Onboard audio offered few frills then. Today however, onboard audio provides an amazing amount of functionality such as multichannel, coaxial inputs, and even optical digital links for truly finicky audiophiles. Many integrated sound solutions even possess the ability to sense whether a microphone is plugged into a speaker jack.

But here's the rub: The overwhelming majority of today's onboard audio relies on the CPU and drivers to perform most of the heavy lifting. This means that if you game or multitask on a system with integrated audio, you'll likely experience PC slowdown that you wouldn't experience when using a soundcard. This is because a soundcard has its own processor. *Maximum PC* remains suspicious of onboard audio, not so much because of the hardware, but because on many motherboards

How We Test Soundcards

A faster CPU usually means faster frame rates in a PC game. The same goes for faster videocards—they result in faster gaming performance. But can the same be said for soundcards? To an extent, yes.

Today's soundcards (including the audio chips integrated onto motherboards) can be divided into two categories: those with digital signal processors (DSPs) that offload work from the CPU, and those that rely on the CPU to do all the heavy lifting. To test a DSP-based card's ability to increase frame rates, we use games such as *Quake III*, *Jedi Academy*, and *Unreal Tournament 2003*, as well as the synthetic, nonreal-world *3DMark2003* benchmark to determine the impact of various soundcards on gaming performance.

Occasionally we go to extreme lengths to test soundcards and other audio devices, but the majority of our testing involves straightforward scientific Lab testing.

Each sound device that comes through our Lab undergoes the same rigorous regiment of tests.

Of course, it doesn't matter if the frame rates rock if the audio sounds like mush. One of the main factors that determine how a soundcard's audio actually sounds is the quality of the DACs, or Digital Analog Converters, used on the soundcard. Are they high-quality components or cheapo 5-cent components?

Our Lab utilizes a set of tools that are able to measure the audio fidelity by analyzing the signal coming from the sound card. Most of these count on a signal that's looped back into the sound card. This is good for generating numbers and charts, but we've also found that it's necessary to use our ears to measure audio fidelity.

To gauge how a soundcard renders audio, we play various high-resolution 24-bit audio samples and listen to them through a set of Sennheiser headphones. This is subjective of course, just as video cards have subjective "visual quality" tests. But even a cauliflower-eared person can hear the difference between a 1998-generation Sound Blaster Live! and a 2003-generation Sound Blaster Audigy 2 ZS. It's typically pretty obvious.

A soundcard is really the sum of its components, features, and software. *Maximum PC* measures all of these aspects.

that we've reviewed, the audio software has been poorly implemented. This may change significantly, however, as Intel's High Definition Audio spec becomes more popular and more prevalent. We'll explore High Definition Audio in a few pages.

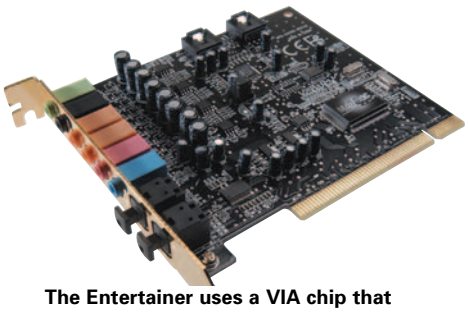
Among the most popular onboard vendors are Analog Devices, C-Media, VIA's Envy, RealTek, and nVidia. nVidia's nForce2 MCP-T audio solution is fairly unique in the audio space and is the one exception to our "onboard sound is crap" rule. Unlike the other onboard competitors, the nForce2 MCP-T is an audio "accelerator," and just like a graphics accelerator, it offloads processing of audio from the CPU. The nForce2 is also unique because it can encode audio in real-time to Dolby Digital. Hook any of the other audio solutions to a home entertainment system's Dolby Digital decoder, and all you'll get is DVD audio or stereo for games. Because the nForce2 MCP-T uses technology developed for the Xbox, it can output games in multichannel to a decoder.

Although onboard audio is clearly becoming increasingly sophisticated, we still prefer the feature orgy associated with add-in cards. The Audigy 2, for example, does 24-bit audio, offers a multitude of I/O options (including a FireWire port), and is unique in its ability to play DVD-Audio discs (in the event you happen to have one of those lying around).

With all this said, Intel's High Definition Audio spec for integrated sound on motherboards bears close examination. Promising 24-bit sound and 7.1 output, this could renew consumer interest in inexpensive onboard audio, even if it comes at the expense of system performance.

Entertainer 7.1 DSP

Cost is no longer a reason for passing up a 7.1-capable soundcard. Mad Dog's Entertainer 7.1 budget soundcard breaks the sub-$50 price barrier while giving you eight channels of audio. Of course, with the low price comes a few compromises.



The Entertainer uses a VIA chip that only provides 20-bit audio through the analog ports instead of 24-bit. But the sound quality surprised us.

The Entertainer uses VIA's Envy 24 HT-S chip, which is similar to the chip found in M-Audio's Revolution 7.1 and AudioTrak's Prodigy 7.1. Unfortunately, the "S" version of the popular VIA audio chip limits analog output to 20-bit, not 24-bit like the aforementioned soundcards. Even if the Entertainer had the higher-end chip, the VIA VT1616 codec limits you to multichannel surround sound. Because the VT1616 is confined to six-channel output, Mad Dog added a second high-quality Wolfson codec for the last two channels. The "24-bit" descriptor on the box can be chalked up to marketing gimmickry.

The truth is, the card provides 24-bit only on the optical-out and not the analog, which is what most people will use it for. Mad Dog also takes liberties in describing the soundcard as having a digital signal processor (DSP). As far as we know, the Envy 24-series of chips does little if any processing of signals; it's all done on your CPU. We also ran into problems updating the Entertainer's drivers using Mad Dog's web site. When we went from the stock drivers to the latest drivers, we lost the ability to drive eight-channel audio. That's bunk.

Still, there is some good news in the dog pound. Even though we've seen similar onboard solutions using the same components as the Entertainer 7.1 (the Albatron Athlon 64 board, for example), the Entertainer performed above average for a budget card when playing high-resolution source material. Perhaps just moving the components to a PCI card and away from the noisy confines of a mobo makes the difference. Mad Dog's card isn't in the same class as Creative Lab's Audigy 2 ZS or M-Audio's Revolution 7.1, which use an AKM codec, but for a list price of $60 (and we've seen it sell for as low as $20), it's a steal, especially when you consider that you get a pair of optical ports as well.

The Entertainer's gaming performance is about what we expected from a host-based soundcard. It's good if your PC has the CPU equivalent of a beefy Alaskan husky. If your processor is more of a poodle, you may want to opt for a more traditional hardware accelerator.

Originally published March 2004

MAXIMUM PC VERDICT 6

SCOOBY-DOO

For less than the price of a good mouse, the Entertainer 7.1 serves up more satellites than Neptune.

SCRAPPY-DOO

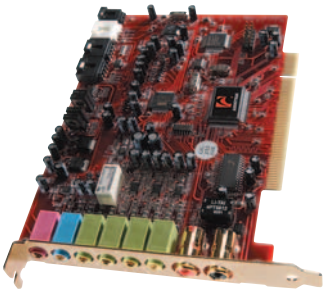
Doesn't live up to box claims of "24-bit" or DSP. Doesn't work with Creative 7.1 speakers.

$59, www.mdmm.com

AudioTrak Prodigy 7.1

AudioTrak's Prodigy boasts 24-bit 192KHz output, uses VIA's Envy24HT chip to handle I/O chores, and relies on the powerful CPU inside your PC for most of its heavy audio-related number crunching.

Notice we use the term "powerful." If you're pushing tin with a 500MHz Pentium III, you'll be in a world of hurt because the Prodigy *does* use CPU cycles that would otherwise go to increasing frame rates. Still, its parasitic draining effect on gaming speeds wasn't all that bad on a high-end PC, especially when put into perspective.



The Prodigy 7.1 has a less punishing effect on frame rates than the M-Audio revolution 7.1, but doesn't sound quite as good.

In the battle for gaming frame rates in a 3.06GHz P4B system, we saw the Prodigy trail Creative's Audigy 2 by 4.6 percent in our *Comanche* test and 2 percent in *Quake III Arena*. In *3DMark 2003*, the Prodigy lagged behind the Audigy 2 by about 8.5 percent. These aren't ringing endorsements for host-based audio, but these performance losses wouldn't threaten the fun of anyone owning a kick-ass PC. What's more, the numbers are certainly better than the 25 percent performance deficit that the M-Audio Revolution experienced in some tests.

Things got really interesting when we fired up *Unreal Tournament 2003*—the Prodigy and Audigy 2 ran neck and neck, while the Revolution was about 24 percent slower. Hmmm. This would seem to indicate that a host-based card *can* go toe-to-toe with the hardware-based audio acceleration of the Audigy 2. And then the issue got even thornier when the cards were running the game with EAX positional audio effects turned on: The Audigy 2 was actually markedly *slower* than the Prodigy.

How can this be? Well, there are two possible explanations. First, the Audigy 2 does boast a dedicated chip to process audio, but not everything is crunched on the card. Certain audio effects are off-loaded to the CPU—just as with the Prodigy and Revolution cards. So maybe the Audigy 2's CPU-based routines just aren't as efficient as the Prodigy's. Second, it's possible that a CPU can process particularly complex audio better than Creative's own soundcard chip can.

In subjective listening tests, we found the Prodigy 7.1 to sound just about the same as the Audigy 2, and a hair worse than the Revolution 7.1. Although both cards use the same VIA audio chip, they use different codecs.

Originally published July 2003

MAXIMUM PC VERDICT

Prodigy 7.1
AUDIOTRAK

+ SACAJAWEA DOLLAR
24-bit support and the ability to redirect audio streams.

– SUSAN B. ANTHONY DOLLAR
Some games will still suffer a frame rate hit.

www.audiotrak.net
$100
8

Creative: The Three-ton Gorilla

As we entered the summer of 2003, Creative's Audigy 2 soundcard was the dominant audio device for high-end PC enthusiasts and gamers. A successor to the company's wildly popular Audigy, this card merited rave reviews when it was released in late 2002, thanks to 24-bit sound and support for 6.1 surround sound.

In the summer of 2003, perhaps in response to some of its competitors'—such as M-Audio and AudioTrak—superior upgrades to 7.1 sound, Creative released the Audigy 2 ZS Platinum. This card featured 24-bit sound, but incorporated 7.1 support into its architecture. While the device featured the same digital audio converters as its predecessor, the Audigy 2 ZS Platinum sounded better to our ears than M-Audio's once-superior Revolution 7.1 card.

The Move to 7.1

In stark contrast to the current state of integrated audio, the big trend that we've seen over the course of the last year in sound hardware is increasing support

"WHEN CREATIVE ANNOUNCED THE PURCHASE OF SENSAURA, I THOUGHT TO MYSELF, 'MAN, THIS COMPANY IS GOING TO CORNER THE AUDIO MARKET."
—GORDON MAH UNG, SENIOR EDITOR

Philips's Aurilium

Philips's Aurilium is a sleek-looking external sound "card" that lets you add 5.1 audio to any PC equipped with a high-speed USB 2.0 port. Amazingly, the Aurilium is completely bus-powered, which means there's no need for an external power brick. Like some other soundcards, the Aurilium promises to recognize and configure your speakers on the fly.

Unlike other sound solutions we've played with, this one works. Plug in a set of headphones and they're instantly recognized as headphones. On the downside, we detected faint static and crackle during booting. Perhaps this is the price of a bus-powered audio device?

External sound cards like the Aurilium allow notebook users to experience high quality sound without having to use an add-in card.

To test sound quality, we listened to 24-bit source material using both the Aurilium and the onboard AC97 codec built into the test notebook. It reinforced what we've been saying for years: Notebook vendors need to improve the audio quality of their laptops! When compared with the Aurilium, our onboard audio sounded like an eight-track tape. The Aurilium's 24-bit audio is easily head and shoulders above what you can find in the majority of notebooks on the market.

At 104dB, the Aurilium is spec'd higher than Creative's Audigy 2 NX (102dB), but we thought the Audigy sounded slightly fuller. In gaming performance, we found the Aurilium has the advantage in *3DMark2003*'s sound test. In other benchmarks, both performed adequately. Unfortunately, Philips dropped the ball in designing the Aurilium's feature set. Not only does the card lack a remote control, it's unable to record in 24-bit audio. Also, folks with 6.1 and 7.1 speakers should take note: The Aurilium tops out at 5.1 audio.

Originally published April 2004

Aurilium

MAXIMUM PC VERDICT 8

+ DVD-AUDIO

Bus powered, and the QSound 3D effects are very pleasing.

– 8-TRACK TAPE

Must reconfigure audio in order to get sound back on when the card is unplugged from a notebook.

$100, www.pcsound.philips.com

for more, more, more speakers. Creative Labs is aggressively pushing a 7.1 speaker solution with its Gigaworks speaker system; with this in mind, the Sound Blaster Audigy 2 ZS supports 7.1 sound. Similarly, Hercules offers two separate 7.1 soundcards.

Interestingly, as we went to press, very few 7.1 speaker systems have been released. Whether or not this many speakers will appeal to consumers, who already find placing five different speakers and a subwoofer in their office, living room, or computer room a physical challenge, is the source of considerable debate in the *Maximum PC* offices.

The 24-bit Question

As its name implies, 24-bit audio simply packs in more audio information than 16-bit audio. If you imagine a sound file as a gentle curve, 16-bit is a jagged stair-step approximation of that curve. By increasing it to 24-bit, the jaggedness is reduced significantly, and the sound is smoother and richer.

One limiting factor of this higher resolution is the lack of source material. Since the majority of PC audio is 16-bit (audio CDs are 16-bit as well), the benefit of 24-bit isn't as noticeable. The higher resolution, however, can benefit even the average game or MP3 file. Because 24-bit soundcards generally use higher-quality digital audio converters and codecs, 16-bit audio source material can sound improved over the garden variety 16-bit soundcard.

Creative Swallows the Competition

In February of 2004, Creative Labs made an acquisition that generated very few headlines, but on the Richter scale of PC audio business strategies, the acquisition feels more like an 8.0. The audio company's acquisition of 3D audio

developer Sensaura from London technology company Scipher placed it in a position to strangle the PC audio market. This acquisition was nearly as significant as if ATI were to buy nVidia, or Intel were to buy AMD.

A small English company, Sensaura develops and licenses several 3D audio technologies. In the PC, the Sensaura engine—an underlying proprietary algorithm used to render 3D audio—powers about 95% of the motherboards and notebooks on the market, including the vast majority of consumer soundcards not made by Creative Labs.

Creative shelled out $5.6 million to buy Sensaura for a number of reasons, including access to a strong audio development tool that works across game consoles and the PC. Additionally, Sensaura has connections with many consumer electronic devices as well as the mobile market—which are two categories Creative has always wanted to enter. And then there are the company's audio-oriented intellectual properties, which include its two-speaker spatializer technology and its realistic-sounding headphone algorithms.

Although Creative indicated that it would continue to work with all the companies currently licensing Sensaura's technology—including its competition—this acquisition gave the already market-leading company the theoretical ability to pull the rug out from under companies that are direct competitors.

This means that, in the short term, nothing will change. Consumers will still be able to get a VIA-based or RealTek-Media motherboard with the Sensaura engine. But what about the long run? Hardware vendors that compete with Creative gave mixed reviews to the deal. One vendor said the deal can only lead to one result: Creative's competitors will

Audigy 2 NX

Like Philips' Aurilium reviewed above, the Audigy 2 NX is high-speed USB 2.0–compliant and provides up to EAX 3 support including Advanced HD. Unlike the Aurilium, it also allows you to listen to DVD-Audio.

Creative's external Audigy soundcard delivers robust 25-bit 7.1 sound.

The NX is smaller than the Aurilium but features four line-out ports, a coax and optical S/PDIF, a line-in, and a mic-in. An optical S/PDIF in-port for minidisc fanatics is also included. The NX isn't bus-powered like the Aurilium, but its power brick is fairly unobtrusive. Unlike Creative Labs's Extigy model, the Audigy 2 NX isn't a stand-alone Dolby Digital decoder. All of those functions have now been moved onto the host processor, i.e., your CPU.

In terms of audio quality, the NX worked perfectly with our 7.1 Gigaworks speaker set. Using the same 24-bit audio source, we tended to favor the NX over the Aurilium—it produces a slightly fuller sound. But frankly, the difference is negligible.

Creative doesn't push the NX as the "optimal" gaming solution, but more as a solution for casual gaming. That's good, because we did suffer a big frame rate hit in *3DMark2003*. In the other game tests—*Comanche 4* and *Quake III Arena*—the Audigy's frame rates held up fine.

We've long hated the difficult-to-turn volume knobs on Creative's soundcards, and the NX is no different. You can't adjust the volume without keeping a hand on the unit to prevent it from sliding off your desk. Fortunately, an infrared-based remote lets you adjust the volume without touching its knob.

Still, as much as we liked this card, would it make our notebook a satisfactory desktop replacement? Not a chance. A PCI card still offers better performance than a USB 2.0 device. *But*, if we were already using a notebook as a desktop replacement, we'd sure as heck want better sound, and the Audigy 2 NX would be our first choice.

Originally published April 2004

Audigy 2 NX

MAXIMUM PC VERDICT 9

+ 7.1

Automatically reconfigures audio on your notebook when disconnected.

– 2.1

Volume knobs are difficult to use and there is no EAX 4.0 support. Sluggish frame rates.

$130, www.creativelabs.com

Glossary of Terms

Confused? Look no further.

API: *Application Programming Interface*. A set of protocols, subroutines, and data structures that makes it easier for a programmer to produce a sophisticated program by presenting what is akin to ready-made building blocks.

DirectSound 3D: A Microsoft API for representing, manipulating, and delivering sound in three dimensions. DirectSound 3D often is used in software that offers positional sound.

Dolby Digital 5.1: A Dolby Laboratories format for representing sound in six discrete channels—five positional channels and a subwoofer channel. This is a popular digital surround sound format, and is used in most DVD movies.

DSP: *Digital Signal Processor*. The chip that digitally processes audio data.

DTS: *Digital Theater System*. A competing format to Dolby Digital that also delivers sound in discrete channels—five positional channels and a subwoofer channel, albeit at a higher bitrate. DTS is used in some movies and is developed by Digital Theater System, Inc.

DVD-Audio: A budding format that uses DVDs to deliver audio with exceptional fidelity. Unlike CDs, which are limited to 16-bit samples at 44.1KHz, DVDAudio can deliver sound that is sampled at up to 24 bits and 192KHz.

Hardware Channels: The number of separate audio streams that the audio hardware can handle simultaneously. Additional channels often can be simulated in software, but at a significant cost in processor attention.

Host-Based Processing: This is the term that's used to refer to audio processing that's done by a system's CPU rather than a processor found on the soundcard. Since it is expensive to design a soundcard with its own onboard processor, some less expensive models simply skip this step and offload all the processing work to your CPU, which can degrade overall system performance due to heavy CPU utilization levels.

S/PDIF: *Sony/Phillips Digital Interface*. A format for transferring digital audio data without first converting it to an analog signal. Generally, there are two kinds of S/PDIF connectors: one that uses the traditional RCA cable and one that uses a fiber-optic cable.

Sampling Frequency: The number of times the sound data is sampled per unit time. Traditional CD audio is sampled 44,100 times a second, and hence has a sampling frequency of 44.1KHz.

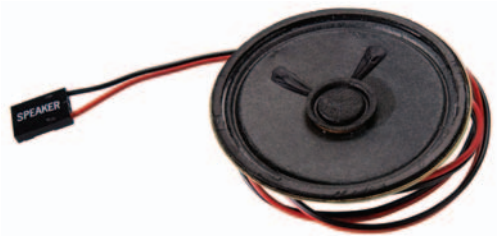
Signal-to-Noise Ratio: The ratio of audio signal strength to that of unwanted background noise. A higher signal-to-noise ratio usually indicates a superior audio product.

lose the ability to license Sensaura products. These critics pointed to Creative Labs's history of vaporizing its conquests, including EMU, Ensoniq, and Aureal. "Given the track record [of Creative], the company will wait until everyone forgets, and then next year, the hammer will drop," said our source, who asked to remain anonymous.

Furthermore, with Creative now controlling the intellectual property of both Sensaura and Aureal, as well as its own large portfolio, building a competitive engine without infringing on Creative's copyrights is going to be legally challenging. The difficulty won't center around making the technology; it will center around making it without getting sued.

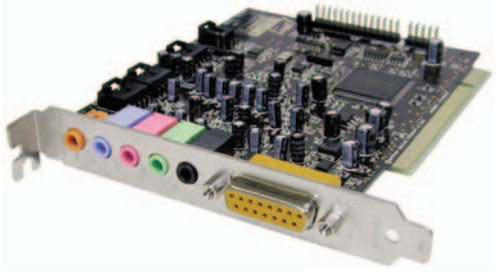
Finally, if Creative were to restrict access to Sensaura's technology, many companies, including Intel, might simply decide to get out of the business rather than develop their own. This bears close examination; if this exodus were to happen, we'll likely all be using Creative's products in the future.

The Five Most Important Sound Devices of All Time



PC Speaker: Yeah, sure it was a crappy-sounding, rinky-dink, monotone audio device. But consider this: It didn't have to be there at all. For the countless years we gamed on our PCs before the Sound Blaster arrived, we nominate the first integrated audio device.

Sound Blaster: The soundcard that started it all, and launched an empire for Creative. The original Sound Blaster emitted two channels of 8-bit audio, which was music to PC users'—and gamers'—ears.



Sound Blaster Live 5.1: The epitome of 16-bit sound, Creative's Sound Blaster Live 5.1 wowed us so much that it stayed on our "Best of the Best" list for a considerable chunk of time. Its high-quality 16-bit sound and 6-channel output kept it there.

Sound Blaster Audigy 2 ZS Platinum: By this point, hopefully you know all about why we love the Audigy 2 ZS. The eight-channel output. The ability to record in 24-bit audio. The incredibly high audio clarity. This card is clearly one of the best of all time.

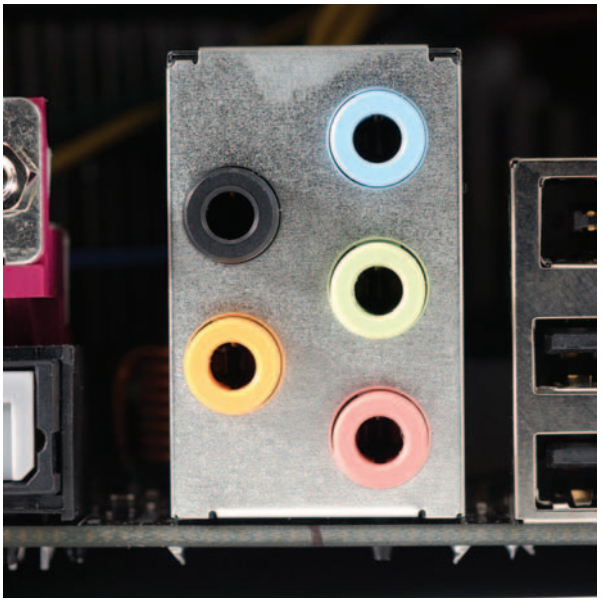
Intel's High Definition Audio: At the time of this writing, Intel's High Definition Audio, code-named Azalia, hadn't been released yet. But based on early evidence—and the 24-bit, eight-channel specs—it's clear that this integrated audio technology will be instrumental in bringing high-quality sound to the masses.

Looking Ahead: Integrated Sound Leaps Ahead

Where do soundcards go from here? Intel's Azalia could revolutionize the integrated soundcard market—and put some pressure on Creative.

Undoubtedly, the big news around soundcards over the next year will be the impact Intel's new integrated sound spec has on the PC market.

In early 2003, Intel announced plans to push an eight-channel audio spec with support for up to 96KHz (192KHz in stereo mode) as well as 32-bit multichannel support. Dolby has been a key partner in developing this high-def spec, code-named Azalia and later dubbed Intel High Definition Audio. Several of its technologies will be options in HD motherboards, including a software decoder that runs off the CPU.



By integrating advanced audio capabilities into motherboards, Intel hopes to bring 32-bit, multichannel audio to the masses in late 2004 with its High Definition Audio spec. So what does this mean for Creative's add-in soundcard market? Read on to find out.

The technology replaces the current AC'97 specification used since 1997 and will complement Microsoft's Universal Audio Architecture, in the process paving the way for broader adoption of "next-gen" audio. More than 80 different companies, including PC and CE manufacturers, codec vendors, software providers, and other industry leaders have teamed with Intel to develop version 1.0 of the spec, which also extends to handheld devices.

Scheduled to be integrated into motherboards by the end of 2004, this new advanced spec will allow consumers not interested in purchasing add-in boards an affordable method of experiencing high quality, multichannel sound in their PC gaming and movie-watching.

> ***INTEL'S HIGH DEFINITION AUDIO SPEC FOR INTEGRATED SOUND ON MOTHERBOARDS BEARS CLOSE EXAMINATION.***

Interestingly, Creative's level of concern about motherboard manufacturers beginning to incorporate High Definition Audio into their mobos was very low. And it should be. Like us, the company expects soundcard sales to remain brisk—PC enthusiasts seeking high-quality audio without affecting CPU usage will continue to snap up soundcards like the Audigy 2 ZS Platinum.

And, given the company's new stake in British technology firm Sensaura, Creative will also likely realize a small financial gain with each new integrated mobo sold.

And What About the Audigy?

We asked Creative what their plans were outside of the realm of integrated sound, and the company, which also has a successful business selling speakers, portable music devices, and other sound-related products, declined to publicly comment upon its future soundcard plans.

Sometime in the beginning of 2005, we expect to see a new, revised Audigy soundcard. Whether that add-in board is named the Audigy 3 or is another variant of the Audigy 2, we expect this product to feature increased audio clarity via a more refined signal processor.

At some point in the near future, we also expect to see an Audigy card that supports 32-bit audio—not that our mortal ears will be able to notice a significant quality difference.

It seems as if the speaker market is reaching its peak with eight channel, 7.1 sound. If this is indeed the case, we will likely see no further increase in the number of channels output by soundcards.

When a Magazine Dreams

If Creative—or any audio company—were to come to us and ask what we'd love to see in next next-generation soundcard or audio technology, we would quickly reply that we can't wait for the day when soundcards and receivers can wirelessly transmit data to speakers. The very notion of a life with fewer cables makes us break into a wide grin.

What's the Difference Between 24-bit and 16-bit?

There's a reason the leap to 24-bit was so significant. Here's a technical explanation.

Stated most simply, the difference between 8-bit, 16-bit, and 24-bit can largely be summarized by numbers. 8-bit sound consists of 256 possible volume gradations—back in the early '90s, this was considered incredible. This is because PC users were accustomed to hearing the chinky *beep, beep* of the PC speaker.

In contrast, 16-bit sound consists of 65,536 different volume gradations. This level of audio quality is comparable to an audio CD. 24-bit is considerably richer than this, and consists of 16,777,216 possible volume gradations, which is akin to audio DVDs.

Another way to think of the difference between 16-bit and 24-bit audio is by comparing it to the video resolution of your Windows desktop, or of the 3D shooters you play. Playing *Madden 2004* at a resolution of 1280x1024 vs. the default resolution of 640x480 or 800x600 will result in a much more vibrant experience because of the increased visual depth. This increased resolution is a result of a higher number of pixels being drawn on the display.

The same goes for soundcards; the higher the bitrate, the higher the audio resolution, and therefore the higher and more realistic the quality level. The human ear is so sensitive that its able to detect even minor variations in pitch, volume, or voice, so the more data "drawn" on our ears, the more realistic a song or sound effect will sound.

With this said, however, there is considerable speculation regarding humans' ability to distinguish the difference between 16-bit and 24-bit audio. In our minds—and ears—however, the difference is significant in both music and PC games.

Chapter Nine

Optical Drives

If you think burn speeds and storage capacities of optical discs will eventually hit a ceiling, you're wrong—for now at least.

Affectionately known as the "Plexy" in the *Maximum PC* Lab, Plextor's 708A DVD burner boasts the fastest write speeds of all the DVD burners we tested over the last year.

When Philips and Sony introduced the compact disc in 1979, vinyl records had the misfortune to be standing directly in its path. These black, circular monstrosities—with their fragile surfaces and analog data—couldn't compete with the CD's deadly combination of digital clarity and rugged portability. A few years later, engineers figured out how to adapt the technology for use with computer data by adding strong error detection and correction schemes, which ultimately led to the demise of the floppy disk. This storage medium then evolved to DVD, which has taken over as the standard to distribute audio, data, and video to consumers. Today, the category continues to evolve at an astounding pace.

One growing concern around optical drives is bezel color. What's the use of building a new PC in a sharp-looking black case if your optical drive bezel is an unsightly beige color?

Over the last year, we've seen a remarkable number of optical drives released. As the year progressed, we witnessed the debut of progressively faster write speeds, nicely configured combo drives, and the June appearance of the very first commercially available dual-layer DVD burner.

It's easy to take this component category for granted; after all, every PC these days has a CD or DVD drive. Whenever we begin to feel complacent about optical drives, however, we think about how much better music sounded with the debut of the CD-ROM, and how much more exciting movies look and sound with DVDs. If our heart still isn't warm enough, we then remind ourselves of the 12-floppy-disk installations the games of yester-year required.

CD and DVD read/write drives fall under the banner of "optical drives" because a laser "looks" at the surface of a disc, where information is encoded in a single spiral track that begins in the center of the disk and moves outward toward the edges. The laser looks for variations in the surface of the disc, from which it derives digital data. For example, the spiral track in a commercial CD-ROM contains a series of bumps and flat surfaces called "pits" and "lands" embedded in a clear layer just below the disc's outer surface. This layer is coated with a reflective material, so that when the laser shines onto the disc, the light is reflected back in one way when it hits a pit, and in another way when it hits a land. These alternations represent the 1's and 0's that make up digital data.

Recordable, or "burned" CDs and DVDs work in a similar way. Optical drive burners have powerful lasers that actually "burn" marks into a layer of dye on the surface of a recordable CD. The burned areas become opaque, while the non-burned areas remain transparent. When a laser reads the disc, the burned areas absorb the laser light, while the non-burned areas allow the laser to pass through and be reflected back by a layer underneath. This alternation creates a digital signal. Commercial, write-once, and recordable DVDs use these same principles to store information.

The Big Trends for the Year Were . . .

Before we jump into our criteria and testing methodologies for judging and recommending optical drives, let's take a quick look at the major developments in this category over the last year.

> ***IF OUR HEART STILL ISN'T WARM ENOUGH, WE THEN REMIND OURSELVES OF THE 12-FLOPPY-DISK INSTALLATIONS THE GAMES OF YESTER-YEAR REQUIRED.***

MAXIMUM PC KICK ASS PRODUCT

Plextor PX-708A 8x Dual Format DVD Burner

Although labeled as an 8x DVD burner, the Plextor PX-708A marks a return to zoned recording speeds. In plain terms, this means the PX-708A begins its write process at approximately 6x, then ratchets up to 8x after burning the first 700MB of data, then slows back down to 4x at around the 3.3GB point.

The Plextor 708A is unique among DVD burners in that it can write at 8x speed to cheaper and more widely available 4x media.

While we're never thrilled when a company uses maximum speeds (as opposed to actual speeds) as a descriptor, we're pleasantly surprised with Plextor's results. The fastest format supported, 8x DVD+R, completed a 4.25GB disc in 8:11 (min:sec). Compared with the 13:14 DVD+R burn time of the last Plextor drive we reviewed (a burner spec'd at 4x), that's a mighty significant improvement, and only about a minute shy of what we hoped to see. Even better, the 8:11 burn time was achieved using 4x media, thanks to some fancy firmware footwork combined with the recommended Taiyo Yuden media. We were surprised to find that we were able to burn discs using our own media at speeds well above what the media was rated for. For example, our 4x DVD+R media from Verbatim burned 4.25GB in 9:41, while 4x DVD+R media from TDK burned in 9:49.

Another big boost to the PX-708A is an unprecedented CD-R speed of 40x (3:21 to burn a 700MB CD, to be exact). Write speeds to all the other formats remain largely the same. The only hiccup in our tests was the drive's refusal to rip audio from two different commercially pressed audio CDs at above 8x—Plextor's "quality first" conservatism ratchets the speed down to minimize errors.

Plextor's optical drives have always been pin-up favorites of *Optical Drive and Servo-Mechanical Monthly*, and the PX-708A is no exception. The access times remain the lowest in the biz, and with 40x CD burning, you can finally retire that crusty old CD burner with the grimy bezel.

Originally published December 2003

MAXIMUM PC VERDICT 9

+ FLAMETHROWERS

The fastest DVD burner available.

– BLAMETHROWERS

Audio extraction can be slow, and reading from CD-ROMs remains at 40x.

$280, www.plextor.com

It's all about DVD: Although a few clueless PC manufacturers still offer PC purchasers the option to choose recordable CD-ROM drives instead of read/write DVD drives, almost everyone who is purchasing a new computer is choosing a recordable DVD option of some kind. DVD is quickly replacing CD as the optical drive standard, which makes sense. After all, DVD drives can play compact discs, but DVD media can hold up to 10 times the data of a compact disc. This trend warms our heart. With more and more DVD drive owners, game manufacturers are going to soon be shipping games on DVD-ROM and not CD-ROM.

CD burners waning, but still important: As long as we use CD players in our car stereos and our living rooms, CD burning will remain popular. Still, though, it's clear that someday—although it may take 10 years—CD-ROMs will be as dead as the floppy disk. In the meantime, CD-ROM burners are reaching outrageous burn speeds. Can you say 64x?

DVD write speeds have increased: Oh, have they. Heading into the summer of 2003, the write speed of most recordable DVD drives was 4x. As we exited the summer of 2004, write speeds were up to 12x, and 16x doesn't feel that far away. Interestingly, as write speeds have increased, writing technology has had to change to keep up. A little background is in order here…

In the beginning, there were 1x CD burners, and they were good. They burned CDs at a constant rate of 150Kbps across the span of a disc. But because the inner rings of a CD, where burning starts, are smaller than the outer rings, the

speed of disc rotation had to be gradually slowed as the laser swept across the surface in order to maintain a constant data rate. This is called *constant linear velocity*, or *CLV* writing. 2x upped the speed to 300Kbps, 4x to 600Kbps, with each step reducing burn times by almost exactly half, up to about 16x. At that point, it became increasingly difficult to maintain burning speeds at higher rates, because problems introduced by disc vibration had to be managed in order to write data and audio reliably.

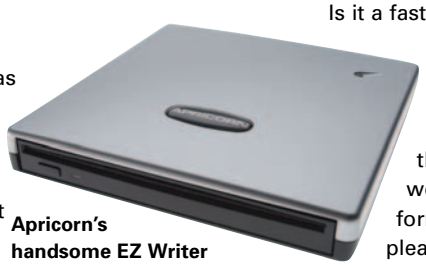
Soon, engineers realized they could take advantage of the larger circumference of the outer rings by spinning the disc at a constant speed, and letting the data rate slowly increase as more data was written to the disc toward the outer edge. This method was dubbed *constant angular velocity*, or *CAV* writing. As a result, advertised x-speeds became expressions of the *maximum* write speed of a disc, not the rate at which the entire disc was burned, because data is transferred more slowly at the beginning than at the end. But soon drive manufacturers found themselves bumping up against the same physical ceiling as before.

Thus, Zone-CLV was introduced. It divided the discs into two, three, and sometimes four speed zones, taking advantage of the varying surface area by spinning the disc slower in the inner rings and accepting the performance penalty, and then ratcheting up the speed as more data is written to the outer rings. This way, manufacturers could brag about "40x" CD burners, even though 40x was only achieved at the last few minutes, and even then, only if the disc was filled to capacity.

The same vexing phenomena faces DVD burners today. 1x drives began at 11.08Mbps. 2x at 22.16Mbps, and so on. But after 4x, physics gets in the way again, and DVD burners have moved to the Zone-CLV strategy. This is why a 12x burner won't be three times as fast as a 4x drive.

Apricorn EZ Writer

"What's that?" asked an inquiring editor as he pointed to the EZ Writer. "It looks like a hot plate."



Apricorn's handsome EZ Writer is a portable burner done right.

Well, perhaps the company name "Apricorn" on the top of the drive doesn't immediately suggest a DVD burner as much as it does a genetically engineered food. But make no mistake about it, this is the only external DVD burner that we'd actually consider packing with our laptops for travel to and fro.

At 5.5-inches square and less than an inch high, the EZ Writer is astonishingly small. The entire drive weighs a mere 12 ounces, and the power supply fits in the palm of a hand. There are only two connections to worry about—the power supply and the USB port. Plug in both, and you're ready to burn CDs and DVDs, and play them back on any PC. Apricorn didn't skimp on important attributes like a 2MB drive buffer and USB 2.0 connection. The slot-loading drive reminds us of how much we miss this design approach. It's much quieter than tray-loading drives, and helps keep the drive profile as slim as possible. The drive can barely be heard during read or write operations. Apricorn even threw in quality software, including Nero Express, Nero Vision (for DVD authoring), and Cyberlink's PowerDVD XP.

Is it a fast dual-format drive? No. The EZ Writer only writes DVDs in the DVD-R or DVD-RW formats, and is limited to 2x and 1x in these formats, respectively. But those are speeds that we're more than willing to accept on the road, and if we had to choose just one DVD burning format, it would be DVD-R. We were also pleasantly surprised by random and full-seek access times that wouldn't be unusual for internal drives reading DVDs and CDs.

Portable optical drives usually disappoint us with rattly trays, a dearth of features, and humongous power supplies that ruin the whole portable concept. Not the EZ Writer. It's simple, elegant, and dare we say, even fun.

One final note: The drive has a slightly raised logo on its surface. This ought to discourage passers-by from putting their coffee mugs on top of it.

Originally published November 2003

MAXIMUM PC VERDICT 9

+ BURNOOSE

Ultra-sleek. Super-light. Easy to connect. Easy to use. Looks good too.

– BURNING MAN

High-priced. Behind-the-curve burning times, and to only one of the major DVD formats (DVD-R/W).

$430, www.apricorn.com

Standards hunting is gone: Finally, finally, finally! One of the trends *Maximum PC* is most grateful for is the fact that, over the last year, consumers no longer needed to read up on competing DVD standards. DVD-R, DVD+R, DVD-RAM—it's enough to drive a sane person crazy. The reason why? Most recordable DVD drives these days support all formats, a development that we hail with a great big "Amen."

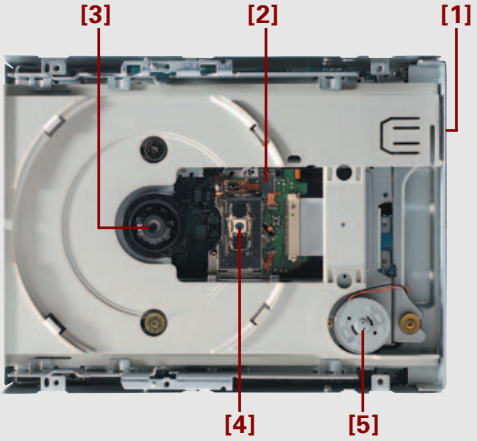
DVD-R falls behind: Interestingly, right as drives have begun to support all standards, DVD-R (pronounced "DVD dash R") began to lose support as the year progressed. Pioneer is the only manufacturer behind the ailing standard; in contrast, a huge consortium is behind DVD+R. As a side note, Apple is also behind DVD-R.

DVD burners in notebooks: As an extension of the ubiquity of DVD recordable drives, we've begun to see more and more laptops shipping with them. An extension of this is that DVD burners are also becoming more prevalent in home theater systems, appearing in TiVos and even standalone DVD player/recorders. Oddly, many of these burners are based on the less popular "-" DVD burning format.

Express yourself: The gradual adoption of recordable DVD has resulted in more of the public expressing themselves. This, combined with the affordability and consequent ubiquity of video cameras, has resulted in more and more people creating their own DVD movies. Another big reason we're seeing more home movies burned to DVDs is the increasing

Anatomy of a DVD Burner

Ever wondered about the inner assembly of your optical drive. Check out this point-by-point map, which explains all the major components.



[1] Interface PCB

This is the main PCB (printed circuit board) that contains the chips and connectors for interfacing the drive to the PC. It also contains special chips for adding all the control information necessary for creating the DVD structure on the disc.

[2] Optics Control PCB

This PCB accepts the signals from the interface PCB and translates them into the laser pulses needed to actually burn the disc and control the focusing and tracking of the laser.

[3] Spindle Motor

This motor controls the rotation of the DVD or CD when it is loaded into the drive. Unlike a typical hard drive, which has only one fixed rotation speed, the motor in this DVD burner has to spin at different speeds depending on the burning task and the media being used. And it has to maintain these speeds with absolute precision.

[4] Laser Optics

This is an amazing assembly consisting of the laser, prisms, and servo motors for focusing and tracking the laser on the DVD or CD for reading and writing. The Sony DRU-510A pictured here can read/write to a staggering number of optical formats, including CD-R, CD-RW, DVD-R, DVD+R, DVD-RW and DVD+RW, among others. Each format has its own finicky positioning and burning requirements, which makes this assembly one of the most versatile of the mechanical components in your PC.

[5] Loading Tray Motor

This motor controls the opening and closing of the drive's loading tray. A good motor should be quiet, and smoothly open and close the tray without funky rattling noises.

Lite-On 52/32/52 CD Burner

This Lite-On CD burner is no looker, but she's a hell of a cooker.

We never dreamed we'd be singing the praises of CD rewriting, but then again, we never thought we'd see the Terminator on our voting ballots, either.

But here we are. We might not all be in agreement when it comes to Arnold Schwarzenegger, but there is consensus about 32x rewriting speeds: They rock. When reviewing this Lite-On drive, for the first time ever, we wrote 647MB to a CD-RW in less than three minutes—2:57 (min:sec) to be exact. 32x CD-RW hardware isn't exactly new, but 32x media has taken its sweet time to arrive. Now that it has, we're impressed. We might actually stop wasting our 700MB CD-Rs just to transfer files to and fro.

It's too bad, though, that the rewriting breakthrough comes so late in the game. We've gotten used to our USB keys for jockeying files from PC to PC. Nonetheless, 32x rewriting does represent something of a "victory" for CD burners, because other CD-RW specs seem to have hit their ceilings.

Rewriting at 32x wasn't Lite-On's only surprise. The drive case shrunk down to a mere 6.75 inches long. That's almost an inch shorter than previous Lite-Ons, clearly a nod to the vast number of folks adopting low-profile Shuttle cases. (We're particularly sensitive about this subject. When we built our $11K Dream Machine in September, an enormous cooling apparatus forced us to Dremel a piece out of our Plextor Premium drive just to make it fit in the drive bay! We should also note that MSI's drive has gone low-pro as well.)

The rest of Lite-On's benchmarks yielded neither surprises nor disappointments. We extracted 74-plus minutes of audio from a commercially pressed CD in a category-leading 2:20. We also burned a full data CD in 2:39, and observed just slightly less than a full 40x write transfer-speed average across the span of the entire disc. (It wasn't too long ago that you'd be lucky to achieve 40x maximum, at the outer edges of the disc.)

Lite-On quickly built a name for itself making quality drives for suspiciously low prices. That tradition continues here.

Originally published October 2003

MAXIMUM PC VERDICT 9

BELLY DANCE

Same high-quality drive for the same low price, but now in a tidy case perfect for small systems.

RIVERDANCE

Comes with *Nero 5.5* instead of the new *Nero 6*. Seek times could be better. Drive tray is rattly.

$70 (MSRP), www.liteonit.com

quality of the software bundled with these drives. Video editing software in particular has become much more powerful and much easier to operate, even for less experienced PC users.

Hello, Dual Layer

The final—and perhaps most significant—development of the last year was 2004's debut of the dual-layer drive, designated by a "DL" that follows the drive standard. The first dual layer drive, released by Sony, was DVD+R DL. We expect to see DVD-R DL drives late in 2004.

Dual-layer DVDs have been commercially available in the form of movie DVDs for years. This format contains so much data—double that of a "normal" DVD—because the disc literally has two layers of data on it: When the end of one layer is reached, the reading laser adjusts its focus to zoom onto the second layer of the disc. This is why, on some very long movies, you'll notice a brief pause or stutter as the laser adjusts itself to read the second layer. (In *Titanic*, one of our notebook battery life test DVDs, this happens just after Leonardo de Caprio gets hauled away for stealing the necklace.)

"MY DREAM COME TRUE? THE DAY WHEN PC GAME MANUFACTURERS START SHIPPING GAMES ON DVD, RATHER THAN ON 3, 4, OR EVEN 5 CDS."

—LOGAN DECKER, FEATURES EDITOR

DVD Glossary

Blue Laser: A new technology that uses a blue laser beam to boost DVD capacity to 27GB. Due to the much shorter wavelength of the blue laser, a lot more information can be burned onto a blank DVD as compared to the current red-laser standard.

Buffer: Memory that is built into a physical drive to ensure continuous flow of data to the drive's laser during recording. Data is taken from its source, fed into the drive's buffer, and then spooled to the drive's laser for uninterrupted writing.

Buffer Under Run: When a drive's buffer empties during disc recording. When a disc is being "burned," the drive's laser is being fed by the disc's buffer. If the source feeding the buffer is interrupted and the buffer empties, the recording process stops. This situation is known as a buffer under run. Today's CD-R and DVD-R drives have technology that prevents this from happening by halting the recording process until the buffer is full again, but drives without it must abort the recording process, rendering the disc unusable.

CAV: Constant Angular Velocity. A mode of operation whereby the optical disc spins at a constant speed. Since the drive spins discs at a constant rate, the speed at which data is retrieved from the disc is dependent upon where the data is located on that disc. Using CAV, a drive transfers data faster from the outer tracks than from the inner tracks.

CLV: Constant Linear Velocity. A mode of operation whereby data passes under the laser at a constant speed. The disc itself spins faster while inner tracks are being accessed, and slows down while outer tracks are being accessed.

DVD+R/RW: DVD+Recordable/Re-Writable called "plus RW." It's one of two competing recordable DVD formats (the other is "dash RW") whose disks can be played in standard DVD players. DVD+R/RW is supported by a group of companies that includes Philips, Sony, Hewlett-Packard, Dell, Ricoh, and Yamaha.

DVD-R/RW: A DVD rewritable format called "Dash RW," which is supported by the DVD Forum and companies like Panasonic, Toshiba, Apple Computer, Hitachi, NEC, Pioneer, Samsung, and Sharp.

DVD-RAM: DVD-Random Access Memory. A DVD-based format with which data can be written and erased repeatedly, one sector at a time. This is in contrast to DVD-RW and DVD+RW, where the entire disc has to be erased before it can be rewritten. DVD-RAM discs are typically housed in a cartridge and are not compatible with standard DVD players.

Dual-Format DVD Burner: DVD burners that can read both DVD+R/RW and DVD-R/RW discs, as opposed to single-format drives that only can read +R or –R disks.

Overburn: The process used to record more information onto a recordable CD or DVD media than it is designed for, such as burning 655MB onto a 650MB CD. This is achieved by writing into the space normally reserved for lead-out information, and is possible only if both the optical drive and the burning software support it.

Red Laser: The conventional 630–650nm red laser beam used in today's DVD players and recorders. The size of the red laser beam restricts a rewritable DVD's capacity to around 4.7GB per layer.

LG Super Multi GSA-4082B DVD Burner

We're all about choice, but LG's Super Multi drive has us yearning for fewer recordable DVD formats, not more.

The company that changed its name from Lucky Goldstar to LG so as to avoid being mistaken for a Sanrio character shows it still has a flair for high-fructose names. "Super Multi" might be a little over the top for an optical drive, but LG backs it up with a drive that supports DVD-R/W, DVD+R/W, *and* DVD-RAM, all in a single unit.

Poor compatibility with set-top players and slow burn speeds have prevented DVD-RAM from catching on with, well, anyone. Nonetheless, DVD-RAM's brawny defect management and tough media cartridges make it a good format for rugged and reliable backups. But the LG's GSA-4082B will only accept DVD-RAM discs once they're removed from their cartridges, thus defeating one of the pitifully few reasons to adopt the format.

The results of our tests weren't spectacular, but they weren't terribly disappointing either. It took 9:10 (min:sec) to burn 4.25GB to DVD+R, and 9:29 to burn the same content to DVD-R. These times fall behind those of most other 8x burners we've tested, from as little as two seconds to as much as a minute. In the rewriteable corner, DVD+RW took 15:04 to burn the disc, and DVD-RW trotted in at 15:41. For some reason—maybe a memo didn't go out—CD burning is stuck at 24x, taking 5:14 to do what should be done in just a few minutes. Burning to 3x DVD-RAM (the top speed for the drive and media) took a lowly 36:32. You'll do it all with the bundled *B's Recorder Gold Basic*, a competent application with yet another cheerfully ridiculous name.

In spite of its versatility, the drive was picky about media. For example, it would burn happily at 8x to our DVD+R Verbatim media, but not to Verbatim's 8x DVD-R; we had to try several different brands before the drive finally agreed to burn 8x to a TDK disc.

It's too bad the Super Multi lacks support for DVD-RAM cartridges (unlike Panasonic's MultiDrive II). The result is a fairly average DVD burner that's saddled with an extra format that, in this incarnation, is even less useful than when we first ignored it.

Originally published July 2004

MAXIMUM PC VERDICT 6

LLAMA

The Super Multi supports all three major DVD formats—like it or not—and does so capably.

TRAUMA

Lack of support for DVD-RAM cartridges is weirder than software called "Gold Basic." Picky about media.

$180 (street), www.lgeus.com

Dual-layer discs consist of two layers of dye substrate that are separated by a semi-transparent metal layer. The method for burning dual-layer DVDs is similar to the standard DVD burning method, with the exception that the laser burns two separate layers. The "top" layer is burned conventionally. The "lower" layer burn is achieved by changing the beam width and power of the laser beam so that it actually passes through the first layer and the metal layer. The end result: the ability to burn a feature-length DVD movie without having to use compression.

In late May, we received Sony's first dual-layer DVD burner. We excitedly put the DRU-700A through its paces. The upside was that we could now burn (and rip, if we so chose) massively long movies to DVD. The downside was that the first generation of dual-layer DVD burners could only write at 2.4x speed. That's a dramatic reduction from the 8x and 12x drives. So, while it's nice to burn extra-long movies, it's going to take a looooong time to write them. For more information on Sony's DRU-700A, turn to our review on page 124.

What We Look For in Optical Drives

Speed is the name of the optical drive testing game. Whether you're talking the high-speed CD burners or dual-layer DVD recordable drives, the very first thing we look for in a new drive—aside from ease of installation, which is typically fairly standard—is performance.

We want to know how fast a recordable optical drive burns data not just because *Maximum PC* is obsessed with speed, but because

there is such a shocking difference between similarly priced drives. In our minds—and this extends to hard drives, motherboards, and desktop systems—if you're going to drop $200 on a PC component, there's no reason to *not* buy the fastest product. There is nothing worse than waiting for your PC to complete a task, so it's important to us that we wait as little as possible. This is especially the case with optical drives. Now that the confusion around standards has subsided, burn speeds are the most critical variable.

Because we're primarily testing for speed, the way we test optical drives is a relatively straightforward process. Logan Decker, our resident optical drive expert tests a new drive's write speeds by using Nero's software suite of CD- and DVD-burning applications. We like using *NeroCD* to test CD recordable drives because it can measure write speeds across the entire disk. Logan writes the same exact set of files and video to disc three times and averages the results. It's important to use the same set of data because this allows us to easily compare one drive to another.

For what it's worth, the fastest-performing 8x DVD burner we've seen to date is Plextor's 708A. Affectionately known in the *Maximum PC* Lab as the Plexy, no other drive came close to matching this drive's performance over the last year. As we were going to print, however, Plextor released the 712A, a 12x version of the drive. For a review, turn to page 127.

MAXIMUM PC KICK ASS PRODUCT

Sony DRU-700A Dual-Layer DVD Burner

Dual-layer burning has arrived, and it's every bit as tasty as we thought it would be. For less than 250 bucks, you can now pack 8.5GB on a single recordable DVD, and make 1:1 copies of your DVD-Video discs without compression. It may not be legal, of course, but that's another story.

Sony even bundles a black bezel with its dual-layer DVD burner for formal evening recording.

Sony's DRU-700A is the first consumer-level burner to offer DVD+R dual-layer recording, and the technology is a modest miracle of engineering. Most commercial DVD-Video discs are comprised of two layers: The bottom layer is stamped on an opaque surface, and the top layer is stamped on a semitransparent surface. This allows DVD players to read from the outside of the disc until reaching the center, at which point the laser refocuses itself to peer through the first layer and onto the second, continuing the read process from the center outward. (The ability to read dual-layer DVDs has always been a requirement of the DVD specification, so theoretically, all players should be able to play them.) Finding the right dye formulations and substrates that would allow a laser to burn onto the semitransparent layer as well as through it was another matter, however. To their credit, the folks behind the popular DVD+R format developed the technology first. While DVD-R dual-layer burning has been demonstrated, no PC products have been announced yet.

Using the DRU-700A, we copied a three hour, 7.9GB commercial dual-layer DVD-Video at a relatively pokey 2.4x in 44:53 (min:sec). But here's the kicker—the disc was read flawlessly by each of the five set-top DVD players we tried it in, and we're talking about models ranging from an ancient RCA Divx player to Kiss Technology's networked DP-500.

The DRU-700A is no slouch in other formats either. The fastest format remains 8x DVD+R single layer, which took 8:55 to burn 4.25GB of data. 8x DVD-R performance trailed behind at 9:38 to perform the same task. 4x DVD+RW burned our disc in 14:25, and although DVD-RW is officially at 4x now, 4x media is nowhere to be found, so burn times are crippled at 2x with current media, resulting in a pokey 30:08 to burn a single layer disc.

Originally published July 2004

MAXIMUM PC VERDICT 9

+ DUAL

The first dual-layer burner is a winner, succeeding where it matters most—compatibility.

– JEWEL

Media is scarce, expensive, and faster dual-layer burners are sure to come soon.

$230, www.sony.com

Other Considerations Besides Speed

While we're performing our speed tests, we also judge and rate optical drives along a few other categories:

Software bundle: What CD- and DVD-burning software apps come bundled with the drive? This has become more and more important as more and more people use their drives for more sophisticated usages besides burning music CDs. In cases where two drives' performance is close, the software bundle is usually the swing vote. Similarly, a higher-performing drive loses points if its bundled software package sucks. (Incidentally, one of our favorite media creation packages these days is Roxio's *Easy Media Creator 7*—it's incredibly easy to use and more powerful than its name would indicate, and a much improved product from previous versions.)

Media compatibility: Many available drives are capable of burning at high speeds to lower-rated media. As an example, some 12x DVD burners are capable of writing at 12x speeds to 8x media. When we test drives that make these promises, we verify these claims.

Ease of installation: Today, this is much less of a factor than it was 10 years ago. This is because drives have become so standardized that they're all fairly easy to install. Typically, the only time ease of installation affects a review score is when it's unusually awkward or difficult.

Bezel colors: Don't laugh! These days, with the proliferation of uniquely colored cases on the market, we find ourselves paying extra attention to the bezel color options of any recordable drive we review. In the words of one of our interns, "It's hecka annoying to build a sweet-looking PC and have it get uglified by a drive bezel that doesn't match."

High-speed Disillusionment

We've found that, surprisingly, unless you consistently burn discs to their maximum capacity, and do so on a frequent basis, you won't benefit all too much from super high-speed CD and DVD burners. Here's why:

Today's drives are known by their *maximum* burn rate, which is only achieved at the very outer edges of a completely filled disc. If you rarely burn full 650MB or 700MB discs, you may *never* realize 52x burning from your 52x drive.

The same is now true of DVD burners—8x is likely as high as CLV writers will go before switching over to the somewhat exaggerated numbers of CAV writing.

If you have a 24x CD burner or above, don't bother upgrading unless you burn tons of absolutely full discs, or unless you want to switch to a DVD/CD-R combo drive or DVD burner. If you have a 2–4x DVD burner and routinely burn full discs, you'd be much happier with a 12x drive.

CD-ROM Media Concerns

Did you know that the type of CD-ROM media you use can affect your drive's performance? You bet it can. There are three major dye formulations used in CD-Rs, and each formulation has a characteristic color. CDs with a golden sheen use phthalocyanine dye; gold discs with a green cast use cyanine dye; and silver-blue discs are characteristic of Verbatim's Azo dye. Each formulation is patented, so manufacturers who want to make their own media must license the formula from the owner.

Which one should you use? That's easy. Check the documentation that came with your optical drive, or the manufacturer's web site for media recommendations. These recommendations didn't come about as a result of back-alley deals or bribes of exotic whiskey. You'll find some media brands recommended over others because these discs have been *specifically tested with the manufacturer's drives*. The proper laser strength for each type of media has been evaluated and programmed into the drive's firmware.

In general, we do not recommend buying cheap spindles of off-brand media, no matter how inexpensive. El Cheapo brands aren't worried about brand loyalty, so they skimp on quality control and you pay the price in discs that are error-prone or that won't retain their data for very long.

Looking Ahead: Optical Drives

IS DUAL-LAYER THE ONLY RECORDABLE DRIVE TECHNOLOGY ON THE HORIZON? WELL, THAT AND EXTRA BEZEL COLORS.

The optical drive PC component category is similar to the soundcard market; while the products in the space have continued to improve over the last 12 months, we haven't seen significant leaps and bounds in technology aside from increasing burn speeds and the release of dual-layer burners.

This situation won't change too much over the next few years. Here's what we see in our USB-powered crystal ball.

The release of the first dual-layer DVD burner—pictured here—means that you can now burn 9.8GB of data to a DVD. Can you say "compression-less movie burning"?

More Prevalent and Faster Dual-layer Burning

This one's kind of a no-brainer. As more dual-layer DVD burners are released, they will be purchased by more people. The big deterrent for now is the high prices of these new drives, and the pokey 2.4x speed at which dual-layer DVD burners write. While the increased data storage makes these new devices incredibly cool in our minds and easily worth the increased wait, we nonetheless expect to see dual-layer write speeds move up to 8x over the course of 2005.

Faster!

While dual-layer becomes more popular, write speeds of good old fashioned single-layer DVD burners will continue to soar in 2005 and 2006. As an example, Philips, one of the major players behind the DVD+R/W format, recently demonstrated a working prototype of a 16x DVD burner that is able to fill a 4.7GB disc in *six measly minutes!* The 16x DVD media spec should be set by mid-year, but Philips cautions that there's little room for speed increases beyond this, as we approach the highest safe rotational velocity for polycarbonate-based media.

We'll see about this theoretical limit; engineers often have the appreciable habit of discovering workarounds for such boundaries.

"THEY'RE A LITTLE SLOW FOR NOW, BUT BEING ABLE TO BURN A FEATURE-LENGTH MOVIE TO DVD WITHOUT COMPRESSION IS PRETTY SWEET."
—LOGAN DECKER, FEATURES EDITOR

MAXIMUM PC KICK ASS PRODUCT

PlexWriter PW-712A

Sexier than it looks, Plextor's 12x DVD burner is the combo DVD burner you've been dreaming about.

What does your optical drive say about you? A skanky drive suggests a skanky PC, and that doesn't reflect well on its owner. A Plextor, on the other hand, sexes up even the dullest of PCs and communicates sophistication, refinement, and ass-kicking performance. Plextor's reputation comes from years of making top-shelf optical drives with cutting edge speeds, exclusive features, and the fastest access times in the biz, and the 12x DVD burner PW-712A continues that awesome tradition.

Let's get this one out of the way: The PW-712A burned 4.25GB of data to a 12x DVD+R disc in an unprecedented 6:25 (min:sec), and that includes about 20 seconds for caching files before the actual burn process began! A full DVD in less than six and a half minutes—can you dig it? Even better, the drive did so using media rated for 8x burning.

The PlexWriter broke another record burning the same data to 8x DVD-R media in just 8:18. Rewriting is snappy but not astonishing; 4x DVD+RW media finished the test in 13:57, and though the PlexWriter supports burning DVD-RW media at 4x, the media itself was still unobtainable at press time, so burning to this format was restricted to 2x, which took 29:36 to finish the task. If you want—or only have space for—a single optical drive, the PlexWriter PW-712A won't disappoint you. 24x CD-RW burning is supported (yawn), but the main attraction is support for 48x CD-R burning. We filled a 700MB disc in just 2:43; that's not enough time for even a potty break. In addition to the fastest DVD burner in the free world, you also get a geek's toybox of software in PlexTools Pro, including GigaRec, a proprietary scheme for burning up to 1GB on an ordinary disc, and SecuRec, which password-protects a disc's contents.

We have just two complaints with the PW-712A: The drive's 7.5-inch length is impractical for mini-systems, and there does not appear to be any way to set the "book type" of rewriteable DVDs, a trick that may increase compatibility with some set-top DVD players.

But those are little nits. The PW-712A once again demonstrates Plextor's commitment to quality engineering, and this drive ought to give any system a huge ego boost.

Originally published July 2004

MAXIMUM PC VERDICT 9

GIGAREC

Fastest DVD burns money can buy. Lots of software.

TRAIN REC

No option for setting book type on DVD-/+RW. Long formfactor.

$190, www.plextor.com

Blue-Violet Special

One interesting new trend we're noticing is that the industry is shifting from the red lasers used in today's optical drives to blue (actually, blue-violet) lasers that can etch more data into the surface of a disc. However, we don't recommend waiting to upgrade your optical drives to blue-laser technology—it's going to take a long time for standards to be established and for prices to come down.

Once upon a time, blue-laser technology seemed like the sexiest thing going in optical drives. Sony debuted the first consumer "Blu-ray" DVD recorder last year in Japan, with optical media that could store up to 23GB each—enough to store two hours of high-definition video. But despite some advances, high-definition TV still hasn't taken off here in the states, and the technology is still too expensive to be practical for PC storage. So Blu-ray, while sexy, is about as practical as buck hunting with an Uzi.

However, with this said, we do expect Blu-ray drives to debut—eventually. We expect to see them become available and popular in 2007.

Chapter Ten

Speakers

Testing speakers used to be fun—now it's almost painful. Read on to find out why.

PC speakers have come a long way in a short time, and now they honestly rival home theater systems due to their incredible power, multiple satellites, and enormous, dual-driver subwoofers.

As a magazine that covers high-end hardware almost exclusively, we're constantly amazed at the sheer audacity of some of the hardware we receive for testing. One of the categories that produces the most gawking is this one: PC speakers.

Not too long ago, most people simply used whatever crappy speakers came with their PC, since most people just used PCs for research, homework, email, and surfing the Internet. All that has changed, however, with the explosion of PC audio in the form of MP3s as well as the arrival of DVD-ROM drives, which have transformed the typical PC into a multimedia powerhouse. This transformation, along with the migration of the PC from the office into the living room, has served as the catalyst for an explosion in both the size and power output of the PC speaker systems.

Modern PC speakers typically look as good as they sound.

The current arms race that has engulfed the PC speaker market started a few years ago when the 800-pound gorilla of speaker manufacturers—Klipsch—entered the fray. Known for its previous work building extremely high-end home theater systems as well as speaker systems designed for arenas and rock concerts, Klipsch's first system literally blew us—and the competition—away. It was a 4.1 speaker system dubbed the V.2-400 due to its obscene 400 watt power rating. No other PC speaker system had ever delivered this level of audio clarity and brute force, and suddenly no PC power enthusiast was content with his or her crappy little desktop speakers or flaccid unpowered subwoofers. Seemingly overnight, Klipsch became the darling of the "prosumer" (high-end consumer) PC crowd, and speaker manufacturers quickly rushed to counter the Klipsch onslaught.

It's hard work designing a breathtaking PC speaker system, and the initial round of "me too" speaker systems that followed failed to match the Klipsch speaker's power output or audio fidelity. This changed in 2002 though, as Logitech, a company known for its own excellent input devices, purchased budget speaker maker Labtech and began selling surprisingly high quality speaker systems. We were completely blown away by the company's Z-560 4.1 speakers (see review on page 132), and stated, "These are the first speakers we've heard that give Klipsch a run for its money." For years no other manufacturer had been able to challenge Klipsch's supremacy in a 4.1 system, but the Logitech's actually sounded better than the Klipsch speakers, and were almost half the price. We were stunned that Logitech could produce such awesome speakers at such a low price point.

Logitech decided to strike again while the iron was hot, releasing a monster 5.1 speaker system in December of 2002 dubbed the Z-680. Employing roughly the same design as the ass-kicking Z-560, but with an extra satellite, more power, and a sexy control pod, the 680s were literally the best speakers we had ever tested. The finishing move was that the Z-680s offered both analog and digital inputs, which could be toggled via the control pod (the only Klipsch offering at the time was strictly analog). Not only did the Z-680s offer the best sound reproduction we'd ever sampled, but the speakers offered more features and were less expensive than the recently-released Klipsch ProMedia 5.1 as well. By definition, these were perfect 10 Kick Ass speakers.

After Logitech had established its market dominance, long-time speaker manufacturer and industry titan Creative Labs decided to join the battle with its Megaworks 6.1 speaker system. This all-new speaker system marked a radical departure from Creative's

> ***"THE CURRENT ARMS RACE THAT HAS ENGULFED THE PC SPEAKER MARKET STARTED A FEW YEARS AGO WHEN THE 800-POUND GORILLA KNOWN AS KLIPSCH ENTERED THE FRAY."***

Klipsch ProMedia 5.1 Ultra

Klipsch's ProMedia 5.1 Ultra set of speakers remains one of our all-time favorites.

The original Klipsch ProMedia 5.1s are still among our all-time favorite speakers. The front-ported subwoofer, sporting an opposed pair of 8-inch woofers, pump out some of the poundingest bass we've ever experienced. The updated Ultra version includes an inverted dustcap on the satellite's driver, a new, less-twitchy control pod, and a much larger subwoofer with a new slot-port along the back, instead of the old-style front port.

The overall sound reproduction for the new ultras is spot on. The new sub handled our 20Hz to 22KHz frequency test without any problems at all, and sounded better at the high end than any other multimedia speaker we've tested. Midranges are excellent as well, and the crossover from the midranges to the low-end is absolutely seamless.

But the new Ultra system does have a minor flaw, which first became apparent when we ran our pink-noise test. We play pink-noise at different frequencies throughout the audible spectrum. At the high- and midranges, the speakers performed flawlessly. However, at the extreme low end, we noticed hints of belching from the sub. We assumed the belching was due to the intense nature of the test, and would be unnoticeable in real-world tests. Unfortunately, we encountered it again when we fired up *Quake III* to test gaming audio. In the Q3DM17 map, we test overall audio response by firing both the rocket launcher and the shotgun at maximum volume. While the response wasn't as punchy as with the Logitech Z-560s, it's still totally within an acceptable range. The shotgun and rocket launcher weren't the problem, though. The background hum in DM17 caused the subwoofer to occasionally belch when the speakers were at high volume. The belching isn't loud, and most folks wouldn't notice it, but we did. It's not a deal-breaker, but it's not ideal.

We really like the redesigned control pod. The old accelerating volume knob, which would blast to maximum volume if hit the wrong way, has been replaced by a more standard non-accelerating knob. The new Ultras still don't include a digital decoder, which we consider necessary for any speakers to receive a perfect score. We'd also like to have a remote control for use in home theater rigs. But despite the flaws, the ProMedia Ultras are great speakers.

Originally published November 2003

MAXIMUM PC VERDICT 9

FLUFFERNUTTER

Astounding audio fidelity with distortion levels low enough to make a brave man weep.

ARTIFICIAL BUTTER

No digital decoder and no remote make Homer something something.

$400, www.klipsch.com

past speaker systems. For years Creative offered lackluster systems that failed to match the competition in price, performance, or audio fidelity (in our opinion, at least).

The Megaworks were a bold step in the right direction, though, and although we didn't think they were significantly better than offerings from Logitech or Klipsch, they were much better than anything Creative had ever produced before. The Megaworks 6.1 were also the first, and only, 6.1 speaker system on the market, as both Klipsch and Logitech have not moved past 5.1 with their top-of-the-line speaker systems.

It was a pretty audacious move, for sure, but Creative's next move was so outlandish it proved beyond a shadow of a doubt that the company was serious about gaining the attention of the hardcore gaming crowd. Not content with a "pretty good" 6.1 system, Creative unleashed an all-new 7.1 speaker system dubbed "Gigaworks." Boasting 700 watts of power, an all-new subwoofer and satellite design, and the ability to be configured as either 5.1 or 7.1, the Gigaworks were the most powerful speaker system available. Even today, some six months after the Gigaworks release, no other manufacturer has picked up the gauntlet and released a 6.1 or a 7.1 speaker system. While it's true that a big motivation for Creative to release a 7.1 speaker system is the fact that its Audigy 2 ZS soundcard supports 7.1, and there's no reason to offer such features in a soundcard if no such speakers exist, we still give Creative big kudos for having the chutzpah to release such a balls-to-the-wall speaker system.

How to Read Speaker Specs

On every box of speakers there is a spec chart. Like most spec charts, the numbers can be misleading as well as confusing. Here's a handy guide to help you sort out the kilohertz from the decibels.

Frequency response: This is the range of frequencies the speakers are capable of reproducing. The sensitivity of the human ear ranges from 20Hz to 22KHz, and most speaker systems closely approximate that range. Speaker sets without subwoofers, however, may only reach down to 120Hz. Such a set can still pump out bass, but it probably won't rattle windows when you crank up the volume. Speaker sets that do include subs usually come with satellites that boast a frequency response of 150Hz to 25KHz—which is just fine, because the subwoofer takes care of everything below this range.

Crossover point: This is the point at which one speaker reaches its capacity to reproduce sound and passes the job off to another speaker in the system. Since speaker systems have high note speakers and low note speakers, the crossover is the boundary between them; everything below the crossover goes to the subwoofer, and everything above the crossover is handled by the satellites. In a really good set of speakers the crossover is around 200Hz.

Maximum output: Audio volume is stated in decibels, a figure that's calculated with a complex formula that takes into account the distance

How We Test Speakers

Testing speakers is almost like a black art, as judging sound reproduction can often be rather subjective. What sounds like "good midrange" to one set of ears might sound rather different to another set of lobes. It's also rather difficult to "benchmark" a speaker system with any reliability, so given these factors we rely on a strict "ears only" approach to testing.

To assist us in determining a speaker system's overall level of quality, we run it through a "real world" testing regimen as well as a pre-selected list of test tones. The real world portion of testing consists of us using the speakers like an average PC enthusiast would, including playing several games at very high volume as well as listening to a litany of high-quality MP3s that we're very familiar with. The choice of games we use depends on what's currently available, and ranges from *Quake III* to *Max Payne 2* to *Call of Duty*. The test MP3s are always the same, and since we've listened to them many times we're very familiar with how they should sound. We also typically will pause a system mid-song and connect a competing speaker system to compare the difference.

Lab testing involves long hours of torture testing, and we're the ones being tortured sometimes. These stacks of subwoofers dished out 1200 watts of bass, which was enough to rearrange our clothing!

Once real world testing is complete, we begin the brutal process of submitting the speakers in question to our test tones. There are a handful of them, and each serves a different purpose. Although we won't describe all of them in detail, the one we are the most proud of is our 20Hz to 22KHz signal sweep. This tone, as its name implies, starts out at 20Hz, which is a tone so deep you feel it more than hear it, and then proceeds to increase in pitch all the way to the very limit of human hearing at 22KHz. At this point most of us are covering our ears for fear of long-term hearing loss, and it's also at this point most speakers begin literally screaming for mercy (you can literally hear the speakers making garbled tones at this frequency).

From this point, the tone then begins to drop back down to where it started. Since this test covers the entire range of tones that humans can actually perceive with their ears, it's a great way to judge a speaker's ability to accurately reproduce sounds, from floor-shaking bass to glass-shattering highs. The test tone also helps us discern how smooth the crossover is from the satellites to the subwoofer.

We employ several other tone-based tests, such as a pink-noise test, but ultimately a speaker's verdict is the result of how it fares in both real-world scenarios as well as Lab-based synthetic tests.

between the audio source and where the decibel reading is recorded. That's why manufacturers often include a distance in the maximum output rating, as in "110dB (decibels) at 10 feet." A volume of 60dB is roughly equivalent to the quiet of a golf course. Dance clubs average between 100 and 110dB. For most people, painful sound levels begin at 120dB.

Power per channel: Often, a speaker system's power per channel (reported in watts) has more to do with marketing than audio quality. Indeed, an inefficient speaker might use a lot of power to generate average volume levels, while an efficient speaker might use only an average amount of power to generate superior volume levels. Producing bass frequencies always requires more power than producing treble frequencies, which is why subwoofers may draw 65W while satellites may draw only 25W. All of these variables should tell you that the power-per-channel spec is a vague measure of speaker quality at best. As a general rule, though, higher numbers in the power-per-channel spec indicate better-designed speakers.

Input connectors: PC speakers are usually equipped with 1/8-inch "mini" plugs that connect directly into the jacks of your soundcard. Most PC speakers plug into the analog connectors, but some can work with digital connections. These speaker sets have a built-in analog-to-digital converter, and they connect with a mini plug or a S/PDIF digital input that uses an RCA plug or a fiber optic cable (named Optical or TOSLink). Dolby Digital speakers often come with a box that contains an amplifier, a Dolby Digital decoder, and a digital-to-analog converter, and they often connect to a soundcard with a single input. Some PC speakers also have auxiliary inputs, so you can connect more than one PC or other device.

Power rating: The combined output of each of a speaker's individual speakers is listed as its total output. This rating, which is stated in watts, is usually listed in one of two ways—Burst or RMS. *Burst* power is a marketing concept designed to trick consumers by listing the peak power of a system rather than what it's able to produce continuously. This usually means a set of speakers is capable of producing, for example, 500 watts for a few seconds, but can only reliably and consistently produce 400 watts. The more reliable rating is labeled *RMS*, which stands

MAXIMUM PC KICK ASS PRODUCT

Logitech Z-560

Logitech signaled its high-end intentions with an astounding 4.1 rig.

The Kick-Ass Logitech Z-560 system employs a novel satellite design to great effect. In lieu of separate midrange and tweeter drivers, the Z-560's satellites use a single 3-inch driver. The interesting thing about the satellites is the metal cone at the center of the speaker, which is used instead of a traditional dustcap. In addition to protecting the delicate innards of the speaker, the metal cone helps focus the sound, resulting in a very tight active sound field. The subwoofer uses a single 8-inch speaker, which fires out crisp, clear bass. We're also amazed at the clarity of these speakers. Our 20Hz to 22KHz sweep is brutal on most speakers at maximum volume, but the Z-560's speakers handled it without any noticeable distortion. In fact, at maximum volume, the Logitech speakers caused the screws on the neighboring Lab benches to vibrate, but we weren't able to detect any infidelity in the sound. It's worth noting that we were wearing earplugs and earmuffs to protect our hearing whenever we turned these speakers to max volume. They're just that loud.

The control setup for the Z-560 set isn't perfect. With power, bass, treble, and a spatialization control, as well as a headphone jack, the control panel has all the necessary accoutrements. But the layout makes the very attractive Logitech control pod awkward to use. Nonetheless, the Z-560 is our new favorite 4.1 rig.

Originally published March 2002

MAXIMUM PC VERDICT

Z-560
LOGITECH

BARRY WHITE
They look good and sound great. These are the first speakers we've heard that give Klipsch a run for its money.

BARRY MANILOW
The control pod for the Z-560 system could use some ergonomic improvement.

800.231.7717 www.logitech.com
$200

10

Creative Labs Gigaworks S750

Designed as an all-out assault on the PC speaker industry as well as on your eardrums, the S750 boasts seven two-way satellites that pump out 70W apiece, according to Creative, and an 8-inch down-firing subwoofer responsible for 210 watts. These analog speakers are THX certified and include both a remote control and a tethered control pod equipped with ports for headphones and an auxiliary device, as well as an M-port for Creative's MUVO MP3 player. Frankly, we were underwhelmed by the small, button-based pod. While we expect a small control pod for 2.1 speakers, a full-blown home theater system deserves an elegant, free-standing control tower with knobs that are easy to operate, especially from a distance.

The Gigaworks 7.1 includes many nice touches, such as extra-long speaker wire, stick-on labels for each speaker, removable satellite stands, and a remote control.

Once plugged in and doing its thing, the S750 offer impressive fidelity. The two-way satellites produce superb high-end response and are capable of extremely bright, crystal-clear highs. Mid-range tones are also stellar, sounding punchy and tight yet never muddy. The subwoofer, however, shows signs of weakness when pushed to the limit. It produces deep, tight bass at moderate volumes, but with the volume turned up, the sub is incapable of extremely deep tones and even belches slightly. For example, during *Max Payne 2*'s sub-rattling Bullet Time sequences, the low-end tones of Max's heart beat left us unaffected.

For DVD watching, the S750 provides the option of listening to 5.1 sound or 5.1 upmixed into 7.1 by taking information from the rear channel and spreading it to the side channels. This is a nice effect that's well implemented, offering a heightened sense of immersion compared with a 5.1 setup. If you're not sold on the concept of 7.1, you're in luck—the S750 is also sold as a 5.1 system and can be upgraded to 7.1 via the two extra satellites for an extra $100.

If you're looking for 7.1 surround sound, the S750 system won't disappoint. While the subwoofer could use a bit more muscle—especially for gamers—the seven satellites provide a level of immersion that the 5.1 competitors can't match.

Originally published February 2004

MAXIMUM PC VERDICT 8

+ POWERED SUB

Outstanding satellites, lots of nice touches, closest thing to a home movie theater we've heard.

– TOGO'S SUB

Subwoofer lacks power, control pod feels flimsy.

$500 (7.1), $400 (5.1), www.creative.com

"WATCHING A SET OF SPEAKERS EXPLODE DURING TESTING IS GRATIFYING INDEED. OUR TESTS ARE CLEARLY DOING THEIR JOB."

—WILL SMITH, TECHNICAL EDITOR

Logitech Z-2200

We'd love to be in charge of configuring any leading speaker company's top-of-the-line 2.1 system. "Hmmm," we'd say, "let's just use two of the satellites and the subwoofer from our top-drawer 5.1 system. Problem solved!" This is exactly what Logitech has done with its stunning Z-2200 speaker rig. The result, not surprisingly, is that everyone who listens to them during testing immediately was literally stunned that two little satellites and a sub could produce such a gut-wrenching level of volume.

During testing of the Z-2200, we were afraid to turn up the volume too loud out of fear they'd make the "brown noise."

The reason for the unilateral surprise is twofold. First, it's been a few years since we last reviewed a high-end 2.1 system and, frankly, we'd forgotten how potent three little speakers could be. Second, this system would surprise *anyone* with its fidelity and power.

Like we said earlier, the sub and satellites are almost the exact same spec as those used in Logitech's top-of-the-line Z-680 set, which has won our Gear of the Year award two years in a row. The Z-2200 speakers breezed through our tests like a bodybuilder tossing around a five-pound dumbbell. The subwoofer rattled a bit in our pink noise test, but remember, this is a test that will literally destroy most budget speakers. In "real world" tests of WAV files, MP3s, and games, the speakers showed no signs of weakness whatsoever. They just cranked out the tunes as loud as we could stand, causing one staffer to suggest we test them with headphones on.

The Z-2200s use Logitech's single-driver phase plug design in its satellites, and they're the best single-driver speakers we've ever heard, just like the Z-680s. Given the range limitations of single-driver speakers, we honestly don't know how Logitech makes a design that can so accurately cover the frequency spectrum from mid-range tones to piercing highs, but it has. Volume control is provided by a wired remote that includes a bass modulator as well as a headphone jack.

We wanted to give these speakers a 10/Kick Ass because it's the ass-kickingest 2.1 system we've ever tested. But because 2.1 is inherently inferior to a 5.1 setup, the Z-2200s get a 9/Kick Ass instead.

Originally published February 2004

MAXIMUM PC VERDICT 9

BASS
Excellent fidelity, amazing power.

BASS WITHOUT THE B
Um… only two satellites?

$150, www.logitech.com

"TODAY'S PC SPEAKERS ARE SO LOUD, BOTH THE PERSON TESTING THEM AND ALL OF US OUTSIDE THE LAB AT OUR DESKS NEED TO WEAR HEADPHONES."

—GORDON MAH UNG, SENIOR EDITOR

for root, mean, squared. As its name implies, this is a mathematical equation, but in layman's terms it represents the amount of power a system can produce continuously, thus making it more reliable in determining a speaker system's overall power.

What Makes a Perfect 10 Speaker System?

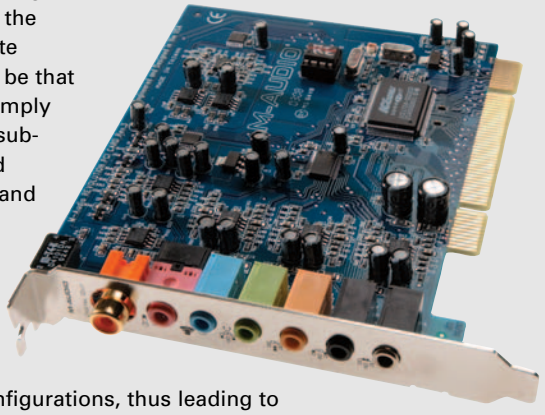
We've only given out a handful of perfect 10 verdicts over the past year or so, and the speaker systems that have received this rare rating are so unbelievably good it almost brings tears to our eyes just to listen to them. So what is required? The first requirement we have is that it must be at least a 5.1 system. There are plenty of incredibly potent 2.1 and 4.1 speaker systems on the market, but due to their limited number of satellites they simply cannot match the level of immersion that is capable with a killer 5.1 setup. And, since we're big fans of DVD movies—especially ones with awesome soundtracks—there is absolutely no comparison between a 4.1 analog speaker setup that is running quad stereo and a 5.1 system with six discrete channels. A good 5.1 speaker system is the minimum for watching Dolby Digital or DTS encoded movies, so this is where our baseline starts.

Next, we want a lot of bass. And it has to be high quality bass, too. We don't care if the subwoofer has one driver or two, just as long as it is capable of reproducing deep bass tones without farting (this happens when the enclosure isn't

2.1, 4.1, 7.1?

Choosing a speaker configuration that is right for your needs as well as your workspace is becoming increasingly difficult due to the proliferation of multi-satellite speaker systems. It used to be that all speaker systems were simply 2.1, or two satellites and a subwoofer, so you just plopped them next to your monitor and called it a day. But as the PC's multimedia capabilities have grown to rival high-end home theater systems, we've witnessed the rise of enormously powerful, multi-speaker configurations, thus leading to the dilemma of finding space for a ring of satellites around your work area.

If you want a 5.1 speaker setup, you're going to need a card that can output to six channels, like this M-Audio Revolution 7.1.



The most basic speaker system is still 2.1, which is the most suitable for folks who simply don't have room for rear-channel speakers or for people who live in close proximity to their neighbors (such as in apartment buildings). After all, it doesn't make much sense to have a 400 watt surround speaker system if you can't crank it up! However, there's no shame in a 2.1 speaker system, as they are capable of incredible power despite their relatively small size, and they all include headphone jacks these days as well.

The next level is 4.1, which is two front channel satellites and two rear channel satellites. For music and movies, the front channel is usually mirrored to the rear channel for quad-stereo, but a lot of games actually take advantage of the separate front and rear channels. This setup is incredibly immersive for gaming and is highly recommended for folks looking for maximum bang for minimum buck.

Next up is 5.1, which adds a center channel to the 4.1 configuration. The center channel is typically only used for dialogue in movies or games and sits on top of your monitor. The big difference though is that the front satellites no longer have to be used for center-channel sound effects, allowing you to hear different sounds from the front left, right, and center simultaneously. This is also the bare minimum configuration if you want to watch DVDs in Dolby Digital surround sound, as they are encoded in 5.1 AC3 audio.

Finally, we have 6.1 and 7.1 as well, which add a rear center channel or two side channels, respectively. These setups can be tricky to incorporate into a workspace since you are literally surrounded on all sides by speakers, but they provide a level of immersion that more simple configurations cannot match. Your workspace, as well as how understanding your neighbors are, should guide your decision.

Acoustic Authority A-3780

The A-3780 speaker rig performed admirably in base-level tests, but exploded under the pressure of *Maximum PC's* rigorous Lab tests.

Never heard of Acoustic Authority before? Neither had we, but we'll test any product sent to us for review if it offers tangible benefits to you, the readers. The hook with the A-3780 is that this speaker setup is quite affordable given their high level of specification. It's not often we see a $100 set of speakers with an 8-inch subwoofer as well as two-way satellites. On paper, the rig seems like the bomb. Lab testing revealed further bomb-like characteristics, but not of the good variety.

We began the A-3780's Lab workout with some casual MP3-ing and gaming, and the speakers fared quite well. Under normal listening conditions they produce deep bass, crisp highs, and punchy midrange. Everyone who heard the speakers during this preliminary testing phase was impressed with their power and sound quality, especially given the low price. We even switched back and forth between the A-3780 and Logitech's Z-2200, which received a 9/Kick Ass in February 2004, and decided the two speaker sets were comparable. The Logitech speakers offer a tighter overall sound with more clarity and power, but the A-3780 is in the same ballpark—quite a feat for an unknown brand.

With casual testing complete, we moved on to more rigorous testing with our regimen of test tones. The speakers handled the first few tones just fine, but in the middle of our 20Hz to 22KHz sweep we heard a "pop" from the left satellite and noticed a rising wisp of smoke. Uh oh. Sure enough, the tweeter had blown. Undaunted, we let the test continue and then ran it one more time just to be cruel. During the second run the right satellite blew as well, rendering both satellites lifeless. Both speakers emitted plumes of smoke when we removed their faceplates to check for physical damage.

So there you have it. These speakers performed quite well during casual testing but literally exploded during benchmarking. We're sure the chances are slim that you'll be listening to signal sweeps on a regular basis, but the fact that they can't take the heat makes them tough to recommend.

Originally published March 2004

MAXIMUM PC VERDICT 3

SKINNY DIPPING
Awesome power and sound at reasonable volumes.

SPEAKER CLIPPING
Questionable long-term viability; speakers blew out in testing.

$100, www.cyber-acoustics.com

capable of moving sufficient quantities of air created by the excursion of the subwoofer), as well as good upper bass for automatic rifle fire and other mid-to-high bass notes.

For satellites, we like the sound to be crisp and clear rather than muddy or muffled. Great-sounding satellites also produce a fairly large "sweet spot," which is where your head needs to be to hear the music as it's supposed to sound. With cheaper systems, as soon as you move your head out of a small bubble that is equidistant from the satellites, the sound quality and power drops considerably. A good set of speakers will project the sound onto the soundstage so well that you can move around a bit and still feel like you're hearing the sound as it's meant to be heard.

Finally, a perfect 10 speaker system must have a built-in Dolby Digital decoder. You see, if you want to watch 5.1 movies in true 5.1 surround sound, you have to have a digital decoder. If it's built into the speakers (and your soundcard has a digital out as well) you just select the input as "digital" and voilà—instant discrete surround sound. Speaker systems that don't allow digital input simply have analog connectors, which are perfect for gaming but leave you up a creek for DVD movies. It should be noted that our current perfect 10 Kick Ass 5.1 speaker system—the Logitech Z-680—has both analog connectors and a built-in digital decoder, so it's really the best of both worlds.

How to Put Your Speakers to the Test

Although we employ an array of synthetic speaker tests such as pink-noise tones and frequency sweeps, we don't recommend you use such tools on your own speakers. These tests push speakers way

How to Place Your 5.1 Speakers for Maximum Effect

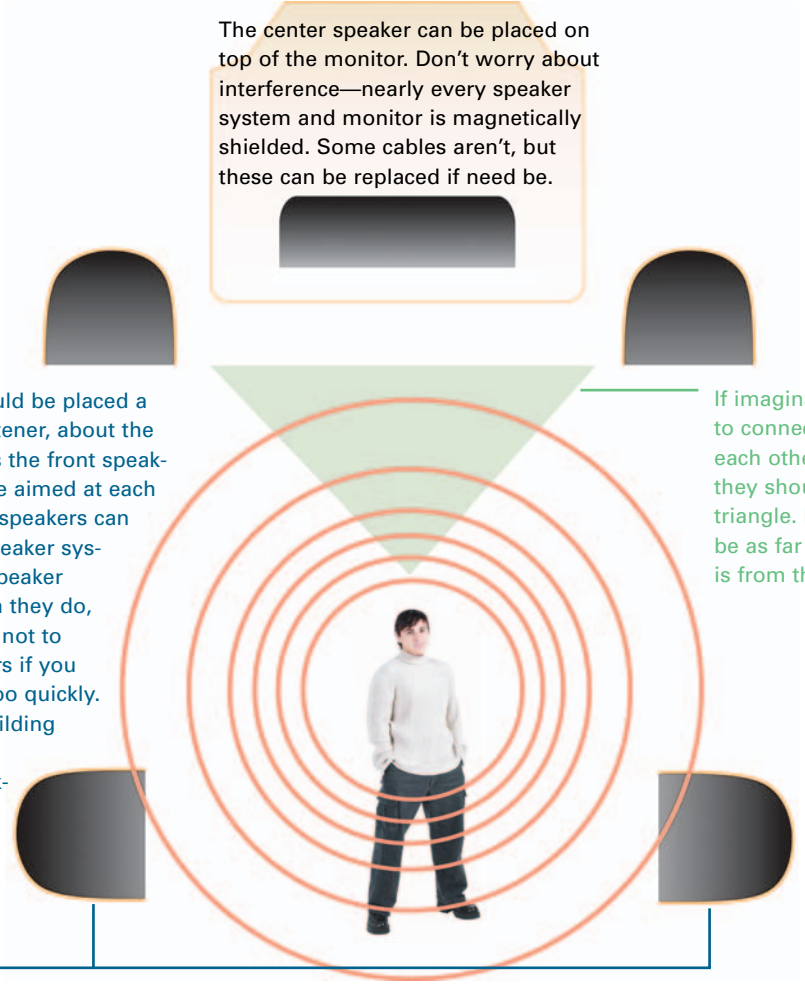
A standard 5.1 speaker system is designed to fit inside a small, rectangular room, but because most people don't have a small, rectangular computer room, this is hardly ever possible. The reality is, computer work areas come in a wide variety of shapes and sizes, which can make it difficult to achieve proper placement of all six speakers in a 5.1 speaker system. However, it is usually possible to find a way, regardless of your room's shape, to place your speakers for maximum positional effect. Here are some tips to guide you in the process.

Wall Mounting

You also might consider mounting speakers to the walls around your desk. Most speaker systems come with stands for the satellites, and, in some cases, the stands convert into wall mounts (such as with the Logitech Z-5300). For those that don't, you might consider building small shelves. It's a simple project that can be accomplished with store-bought goods or a pre-fabbed shelf from Home Depot. Also, remember that if you can't place the rear speakers in the exact spot you'd like, most soundcards let you tweak the volumes of each speaker or pair in order to obtain an ideal listening experience.

Time to Tweak

Once you have your speakers in place, drop in a movie with a notoriously excellent surround sound sequence—we recommend *Saving Private Ryan* or *Gladiator*—and try moving the satellites and sub around to note the differences. Perhaps the sub sounds better in the corner vs. underneath the TV stand. Or maybe the rear channels need to be a little further back, or facing toward a wall rather than toward your ear. Every room is different, so play around with different settings and stick with the config that sounds best to your ears!


The center speaker can be placed on top of the monitor. Don't worry about interference—nearly every speaker system and monitor is magnetically shielded. Some cables aren't, but these can be replaced if need be.
The rear speakers should be placed a few feet behind the listener, about the same distance apart as the front speakers, and they should be aimed at each other. Placing the rear speakers can be a challenge. Few speaker systems come with rear speaker stands, and even when they do, you have to be careful not to knock over the speakers if you slide your chair back too quickly. You might consider building stands out of wood, or hanging the rear speakers from the ceiling.
If imaginary lines were drawn to connect the front speakers to each other and to the listener, they should form an equilateral triangle. Each speaker should be as far from the listener as it is from the other speaker.

beyond what an average user would ever subject them to, which can result in short-term or possible long-term damage. We test them this way because that's how we treat all hardware, and because typically we only have a very short amount of time to test them and need to determine if they can hold up under rigorous abuse.

For the average home user, it's just not necessary to run frequency sweeps and such—just listen to your favorite audio files and see how they sound. If you are testing for audio fidelity, do not test with crappy 128Kbps MP3s though. Either use high-quality WAV files, or 320Kbps MP3s or equivalent.

If you're looking for ways to test for gaming, one of our favorites is *Max Payne: The Fall of Max Payne*. We start up a round of the Dead Man Walking mini-game, put it into God mode with all ammo available, and just start shooting everything that moves. The Bullet Time mode creates extremely deep bass as it reproduces the sound of Max's heart beating, and when combined with automatic gunfire and explosions all happening at once can really put a speaker system to the test.

MAXIMUM PC KICK ASS PRODUCT

Logitech Z-680

On the surface, the Z-680 is a standard 5.1 speaker rig. But once you begin appreciating its majesty, its sheer bombasity, it becomes nothing less than a Klipsch killer. That's right: Everything that made the 4.1 Logitech Z-560 set so awesome is now available in a 5.1 system—the Klipsch ProMedia 5.1 has been effectively dethroned!

The Logitech Z-680 stand alone as the only 5.1 speakers that include both analog and digital inputs, making them superb for gaming and movies.

The Z-680 has five satellites, a front-firing eight-inch long throw subwoofer, and a control pod. The control pod is armed to the teeth with three mini-headphone inputs for the standard analog PC 5.1 setup, a coax digital input, and a TOSlink optical digital input. Now, all the inputs in the world don't matter a whit if your speakers don't sound great, but the Z-680 didn't let us down. This 450-watt bad boy can create a deafening wall of sound while still faithfully reproducing the softest tinkling chimes playing in the background.

We ran through our usual gamut of speaker tests and found no flaws with the Z-680's playback, even in our demanding 20Hz-to-22KHz frequency sweep. We were almost floored by the volume and intensity of the bass that these speakers produce. The attorneys in the offices next to ours were banging on the wall after just *two* of our eight audio tests—that's a new record! The only phrase we can think of that even begins to describe the power of this sub is "innard jiggling."

Logitech took much of what it learned from the Z-560 4.1 set and applied it to the new Z-680. The satellite design is virtually identical, sporting solo 3-inch drivers with aluminum phase plugs. The 5.1 set also addresses the complaints we had with the 4.1 set by providing a much more sturdy control pod (one that doesn't tip over), and including an input for our MP3 players. Unfortunately, Logitech is still shipping confusing speaker wire ("Which wire is positive? Which is negative? We'll never know!").

If you want the very best speaker rig we've heard for your PC, your console, and your DVD player, the Logitech Z-680 can't be beat.

Originally published December 2002

MAXIMUM PC VERDICT

Z-680 Speakers
LOGITECH

+ THE ROLLING STONES

Innard-jiggling bass, fantastic mid- and high reproduction, and a bevy of input options make these our new favorite speakers.

– ENYA

Logitech is still shipping with wire that makes it almost impossible to distinguish the + from the – wire.

www.logitech.com
$400
10

Looking Ahead: Speakers

How does a category that's already refined get any better?

Though most categories of hardware lend themselves to casual guesses as to what lies ahead, the speaker category really has us scratching our heads. The reason we're so unsure as to the future of the market is that it seems, at this point in time at least, that several highly evolved, ass-kicking systems are already available in every speaker category. There is a wide assortment of incredibly powerful speaker systems spanning every possible speaker configuration needed, and all of these speaker systems offer superb audio fidelity with amazing power as well. We've already awarded Logitech a perfect 10 Kick Ass for its stunning Z-680 5.1 speaker system, and our opinion is that the system doesn't really need any more features or power, so what could they possibly do to make it better? Herein lays the crux of our befuddlement.

Flat panel speakers like these from Monsoon were once thought to represent the future of speaker design, but that revolution never came to pass.

There is, however, one area of the market that so far has been woefully undeveloped, and this is the 6.1 and 7.1 speaker configurations. At press time, only Creative Labs had dared to produce such speaker systems, with Logitech and Klipsch holding steady with their 5.1 systems. Will they take the plunge and add a few satellites to their systems? Only time will tell, but we're inclined to believe they won't, simply because their current 5.1 speakers are already pushing the limits of the space constraints most of us find in our computer areas, and who has room for even more satellites? One argument for more satellites is that it adds even more sonic output to a system, but with 5.1 systems already pushing 500 continuous watts it's hard to believe people actually need more power for their PC's speaker systems.

"SINCE I LIVE IN AN APARTMENT, TESTING SPEAKERS IN THE LAB IS A REAL TREAT BECAUSE I CAN CRANK THEM TO FULL VOLUME AND REALLY SHAKE THE WALLS. THE LAWYERS WHO WORK NEXT TO THE LAB DON'T LIKE IT MUCH THOUGH."

—JOSH NOREM, CD AND WEB SITE PRODUCER

Chapter Eleven

Pre-built PCs

Here we'll take a look at the rapidly changing pre-built PC market, and finish things off with some insight into Maximum PC's notorious Lab tests.

Who said a pre-built PC has to be boring? Voodoo's Rage f50 blew us away with a moody, intimidating look, fantastic performance, and a silent configuration. For more on the Rage f50, see our review on page 145.

Given our druthers, *Maximum PC* will build a system rather than buy one any day of the week. Why? Because:

When you build your own system, you can choose *exactly* which components you want, from the mobo to the type/speed of memory to the optical drives to the hard drives. This is really the only way to ensure that you procure the fastest, surest parts for your PC.

If you want to eke extra, free performance out of your system, you'll want to overclock it. But many PC resellers refuse to overclock the PCs they sell because doing so can create stability issues, which creates warranty issues. In fact, we rarely review overclocked PCs and recommend against buying them from manufacturers for this reason.

Building your own system is enjoyable. Is there anything in life more fun than speccing, planning, buying, and building the various components of a new PC? No. No, there isn't.

With this said, however, PC manufacturers offer several advantages over build-it-yourself systems. For starters, manufacturers such as Dell, Falcon Northwest, and Alienware can get their hands on hard-to-find parts. As an example, Intel's Pentium 4 Extreme Edition was extremely scarce when it was first released. While three of these system vendors offered up systems based on the high-end CPU, if you were trying to build your own system based on a P4EE, you were out of luck.

One other advantage PC vendors have over home-built rigs is stability. When you build your own system, it's always possible that the fruits of your labor could be a rig that is improperly assembled or just flat-out won't work. While it's also possible that a pre-built PC will suffer from instability or bugginess, system makers invariably offer a wide range of warranties and customer support options.

Released in April, iBuyPower's Gamer Extreme boasted power and a crazy Transformer-esque look.

On top of this, there's the emerging popularity of the portable PC market—laptops and tablet PCs. Because it's close to impossible to build your own laptop, if you're looking to compute on the go, your only option is to buy pre-built. The downside to the laptop market has traditionally been that performance often gets sacrificed in favor of portability. This situation is beginning to change, however; we'll discuss some of the high-performance notebooks available at the end of this chapter.

For the preceding reasons, the budding PC enthusiast, casual user, and even high-end system hog often prefer to buy their PC and upgrade it, rather than build it from scratch. We can't say we wholeheartedly approve of this, but we definitely acknowledge the convenience. This is why *Maximum PC* reviews at least one desktop PC or laptop, and often more, each and every month.

Rapidly Evolving PC Market

Between *Maximum PC*'s independent reviews, system roundups, and laptop roundups, we test and review somewhere between 60 and 75 different PCs a year. This is a small, small percentage of the total number of systems made available each year.

So how do we decide which ones to review? We decided years ago that, because *Maximum PC*'s emphasis is on high-end components, performance, and speed, we would rarely review systems by the big PC vendors. Big companies like Dell, Gateway, and Compaq often use less-than-stellar components in an effort to bring more affordable prices to consumers.

> ***THE FASTER YOUR SYSTEM, THE LONGER IT WILL LAST BEFORE YOU HAVE TO PAY TO UPGRADE IT IN ORDER TO GET EVEN FASTER PERFORMANCE IN THE LATEST PC GAMES.***

This is okay by us—we applaud affordability because, in our opinion, the world is a better place when more people use PCs. But our Lab, along with our readers, is enamored with finding and testing the fastest systems on the market. For this reason, we tend to review hand-built systems by smaller vendors

Hy-Tek Tek Panel 300

Convergence gets better with Hy-Tek's living room PC.

Hy-Tek's innovative PC-display combo puts forth a decent blend of PC functionality and TV watching pleasure.

Conceptually, the Tek 300 is easy to understand: Take a super-bright 30-inch widescreen LCD flat panel, jam a PC into it, and set it up in the living room. And, no, we're not talking about a watered-down integrated motherboard and bottom-feeding x86 knockoff. Hy-Tek uses an ATX motherboard as well as an ATI All-in-Wonder 9700 Pro videocard while keeping the whole package down to a svelte five inches in depth.

Rated at 450 nits (a measurement of luminance), the Tek Panel 300 is so bright you'll literally need sunglasses to view the screen from any closer than three feet. That's okay—it's meant to be hung on a wall in your living room. The presence of the All-in-Wonder card means that it's quite capable of displaying TV or playing DVDs in widescreen format.

The older generation of the "Wonder," however, isn't quite ready for tomorrow's games, especially when paired with a moldy old 2.4GHz Pentium 4. We can understand why Hy-Tek would choose a subsonic Pentium 4B—it keeps internal temperatures in check—but we're confused why the company paired the CPU with an 845PE motherboard. Why limit this baby to a 533MHz bus and single-channel DDR? By using a P4C on an 800MHz bus, even at a plodding 2.4GHz, the Tek 300 would at least have Hyper-Threading, which would mitigate some of the performance discrepancies.

The single-channel DDR and P4B combo hurt the Tek Panel's performance, as is evident in every benchmark result, from *Premiere Pro* to *MusicMatch* to the P4-loving *SYSmark 2002*. Because the Tek Panel 300 only supports a maximum resolution of 1280x768, we couldn't run our two gaming benchmarks at our default res of 1280x1024 (chosen because it's the native resolution of most 17-inch flat panel monitors). Running at 1024x768, *Halo* looked great and produced a barely acceptable 33fps, but *Jedi Academy* could muster just 17fps. That's not good enough in today's world.

Given the Tek Panel 300's primary function as a living room device, the sub-standard performance isn't a critical flaw. However, we do take umbrage with the lackluster audio subsystem. Hy-Tek uses SoundMax, which is not a bad choice as far as onboard audio goes. But many users will want to pair this TV PC with a high-quality surround sound system. Unfortunately, the system lacks support for optical or coax SPDIF output to hook up an external decoder. D'oh!

Originally published January 2004

MAXIMUM PC VERDICT 8

JOHN MADDEN

Bright, bright screen and upgradeable parts make it better than any other Media Center PC.

BOB CALLAHAN

533MHz bus processor and single-channel DDR bring performance way down.

$6,495, www.tekpanel.com

like Falcon Northwest, Alienware, Voodoo PC, and the scores of other "boutique" manufacturers that have begun cropping up. These resellers focus exclusively on high-end performance and gaming PCs.

The downside to these custom-made systems is that they're pricey; if you hand-make a PC using only the finest parts, it's going to cost a bit more than a Dell. But consider this: The faster your system, the longer it will last before you have to pay to upgrade it in order to get even faster performance in the latest PC games.

Over the last year, more and more PC enthusiasts have migrated toward buying their systems from these boutique shops, and the result has been an explosion in the number of small companies selling custom-built PCs. From the super high-end designs to more basic rigs, more and more mom-and-pop shops have popped up. Some offer low-cost, high bang-for-the-buck PCs; others offer no-holds-barred PC power. Many offer a combination of the two.

Whatever the PC performance modality, these new companies have introduced a welcome influx of innovative new ideas into the proverbial system-building gene pool. Let's take a look at some of the major players and trends in this rapidly exploding market.

Falcon Northwest Fires Out the Frag Box

The very first PC manufacturer to focus exclusively on high-end PC-building, Falcon Northwest has existed for years. The company is well-known and well-regarded for its ability to quickly ship performance-packed systems as well as its

How We Test PCs

When we test pre-built systems, we mean business—here's how we go about our benchmarking.

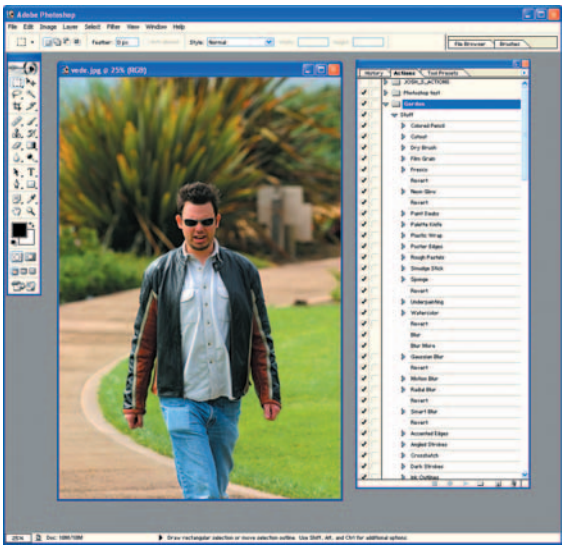
When it comes to Lab-testing the pre-built systems that vendors send us every month, we're like new parents: Every new PC is a bundle of hope and potential joy. This optimism lasts for at least a day, mostly because it takes our Lab *a full day of testing* to ascertain its quality level. That's a lot of testing.

For our PC benchmarking, we prefer to use real-world applications such as *Photoshop* and *MusicMatch* to gauge system performance. Synthetic tests that run raw math calculations have their place in some product evaluations, but they can't, for example, tell you how a particular CPU upgrade might affect frame rates in your favorite game. Plus, as advocates for PC enthusiasts worldwide, we want to do everything we can to encourage the use of real-world tests. Here's why: Hardware vendors will always tweak their drivers to do well in benchmarks. When they tweak them to excel in synthetic apps, the driver revisions can actually lead to *lower* performance in real-world apps. But when they tweak drivers for real-world apps, software users actually reap tangible benefits.

Here's a breakdown of the rigorous battery of tests each PC we review receives.

SYSmark2004: If you're big on benchmarking, you've probably already read about *SYSmark*. In terms of PC testing, this is *the* big one. Every version of the system-testing suite uses the kernels of real-world apps to gauge overall system performance—CPU speed, bus speed, memory speed, and even hard drive speed. This benchmark is so beefy that we'll be discussing it in further detail later in this chapter.

Premiere Pro: *Premiere Pro* performance is almost entirely tied to CPU performance, but if a system is short on memory, the app will hit the hard drive, and this will increase processing times. In 2003, Adobe's video-editing warhorse *Premiere* received an entirely new software core that fully supports Intel's Hyper-Threading technology and multiprocessor machines. Before we run our own homegrown *Premiere Pro* test, we defrag the system's hard drive. We then load the test file—a 313MB AVI file of birds soaring over a shoreline—and run it through an action script. Results are timed with a stopwatch; lower scores are better.



Our Photoshop test stresses and gauges a system's performance capacity.

Photoshop 7.0.1: The world-renowned image editing app is a big presence in our benchmarking suite because it hooks into all PC hardware subsystems; our test likes a fast CPU, lots of RAM, plenty of bandwidth, and a fast hard drive. Instead of hand-picking a small number of filters to run (and thus inevitably favoring a particular CPU platform), we decided to just run 'em all, and let God sort it out. Before we run this benchmark, we defrag the system's hard drive, reboot, and set *Photoshop* to use 75 percent of available system memory. We then load our test file (a 2MB JPEG), and start timing the action script.

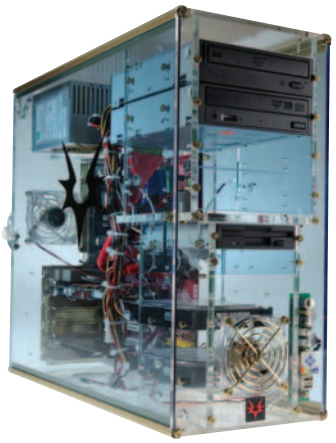
MusicMatch 8.1: The *MusicMatch 8.1* MP3 encoding and music management app comes standard on many OEM machines, and its encoder is among the best. The software tends to favor raw CPU clock speed, but that's to be expected, as we haven't run into many MP3 apps that don't favor the P4's raw frequency power. To run our test, we first copy an Audio CD WAV file—track 2 from the *Star Wars* soundtrack—to our desktop. We then set *MusicMatch's* processing level to "very high" and convert the file to a 160kbps MP3, timing how long the conversion takes (lower scores are better).

Jedi Academy and Halo: For many readers, gaming is the ultimate benchmark because many gamers use their PC power to play the latest 3D games with all the details cranked up. These two games are both resource intensive (also known as "system ball breakers") and measure CPU throughput and videocard performance.

Vicious Assassin Special Edition

A gorgeous clear case combined with high-speed performance? Sign us up!

We hate to admit it, but we love clear cases. And why not? If you're going to spend two paychecks on red or blue PCB hardware and lights, why wrap it in aluminum or steel when you can go au naturel and let it all hang out? But at the same time, we have to admit that clear cases can also be a horror. They're hard to keep clean and occasionally crack or otherwise fall apart. Thanks to Vicious PC, however, this final flaw may no longer be a factor.



Clear and lovely, Vicious's Assassin rocked our world.

The Vicious Assassin is not the first clear-case PC, but it's certainly the finest. Illuminated by an array of blue LEDs strategically placed around the case and a pair of multicolored fans, this system is both elegant and eye-catching. Despite the inclusion of just two relatively quiet fans, their careful placement and the airy internal layout ensure high-quality ventilation. More importantly, thanks to the four metal rails, heavy-duty acrylic panels, and a remarkably rigid structural design, Vicious PC managed to produce a case that feels as solid as it is sexy.

If the beauty ran only skin deep, we would have considered this system a pleasant distraction and nothing more. But the Assassin also packs quite the hefty punch. At its heart is a MSI K86-Neo mobo hosting AMD's brand-new Athlon 64 3400+ CPU. This mobo, which uses the VIA K8T800 chipset, is an excellent performer, and when combined with the 2.2GHz CPU, is able to trounce systems built around the vaunted FX-51 in many tests (more on that later).

Our review system came with a pair of 256MB Kingston Hyper-X DDR400 memory, and a pair of Western Digital Raptor (WD360) SATA 10,000rpm hard drives operating in a RAID 0 array. The PC sports a Toshiba 16x DVD reader and an NEC ND-1300A 4x DVD-RW burner, and the 256MB ATI Radeon 9800 XT and 7.1 channel Sound Blaster Audigy 2 ZS made us happy.

In the Lab, we found the Assassin to be a remarkable performer. Even though its 3400+ CPU lacks the FX-51's dual-channel memory controller, it's clocked at 2.2GHz, which is 10 percent faster than the Athlon 64 3200+. This combined with the VIA KT800 chipset makes for dynamite results. The system posts a *SYSmark 2004* score of 198, which smacks around our FX-51 reference system by a whopping 26 points.

MAXIMUM PC VERDICT 9

HAMMURABI

Beautiful, fast, and fairly priced.

SADDAM

Annoying hex screws that won't stay tight, 4x DVD burner.

$3,000, www.viciouspc.com

"WHEN ALIENWARE ANNOUNCED ALX, ITS NEW BOUTIQUE LINE, WE COULDN'T HELP BUT CHUCKLE. THE FORMER BOUTIQUE PC SHOP WAS ANNOUNCING A NEW BOUTIQUE LINE!"

—WILL SMITH, TECHNICAL EDITOR

ability to apply gorgeous-looking paint jobs to its rigs. In late 2003, Falcon added the Frag Box to its product line. An edgy-looking small formfactor box built for speed and portability to LAN parties, the Frag Box was an instant hit with consumers. Other system integrators soon followed in Falcon Northwest's wake, releasing SFF systems of their own.

Alienware Goes Big-time

The last 12 months were an interesting period for Alienware. The company, which was one of the first to begin shipping cool-looking customized colored cases, made further attempts to grow itself from a boutique shop into a more mainstream system reseller. This strategy began in 2002 when the company inked a deal to sell its systems at Best Buy stores.

Unfortunately, in 2003, this deal fell apart; details explaining why and how have been scarce. Still though, Alienware maintained its reputation for building remarkable-looking high performance PCs. The company's Area-51 and Aurora desktop systems garnered considerable praise for their looks as well as their benchmark results. Similarly,

Voodoo Rage f50

Silent and powerful, this rig sports an innovative look.

To counter today's ever-louder systems, Voodoo has created the first PC that we know of to use an entirely passive cooling solution. Instead of moving fans, a water-system, or some sort of exotic refrigeration method, the Rage f50's *case* is the cooler.

Voodoo created the moody-looking Rage f50 by customizing Zalman's passively cooled case.

The f50 case—a customized Zalman TN 500A—is composed of an elaborate system of heat pipes and cooling blocks that transfer heat from the internal components to the case chassis itself, which essentially functions as an all-encompassing heatsink. Each side of the heatsink case is a solid piece of metal that sports a series of cooling fins. As air moves over the case and fins, it diminishes the accumulated heat, keeping the PC's innards nice and cool.

By using a purely passive cooling system, the Zalman case minimizes the number of moving parts inside the PC, thereby reducing noise. Indeed, the only mechanical parts in the Rage f50—and thus the only source of noise—are the optical drives and hard drives.

In the interest of temperature management, Voodoo eschews the hotter Athlon FX in favor of an Athlon 64 3400+ CPU. But by pairing this slower CPU with a VIA chipset-based Asus K8V-Deluxe mobo, the f50 is nearly as fast as our zero-point machines, which use FX-51 CPUs on nForce3-based chipsets. As it is, the f50 requires five heat pipes to cool the Athlon 64 3400+. A faster dual-channel FX processor would call for even more apparatus. Heat issues notwithstanding, Voodoo didn't skimp on the videocard. The f50 boasts a powerful Radeon 9800 XT.

In the *Maximum PC* Lab it was virtually impossible to tell when the PC was on or off when were standing right next to it. Even the drives' noise was masked by the noise of neighboring PCs. In a room by itself, the f50's operation is audible, but it's still the quietest PC we've ever tested.

Cool as it is (forgive the pun), a rig this specialized requires extra attention. Zalman—the case's manufacturer—recommends you keep your PC out of direct sunlight and away from heaters, lest you thwart the efforts of the passive cooling, thereby exposing your components to the risk of overheating. This should also interest people who live in hot climates or lack air conditioning.

Still, the Rage f50 is worthy of attention from hardcore PC geeks, for both its novel and effective cooling methods as well as its tough, radiator-like design.

Originally published May 2004

MAXIMUM PC VERDICT 9

+ PASSIVE COOLING

Performs well and is damn-near silent, even when playing games or running benchmarks.

– PASSIVE AGGRESSION

The system is heavy, difficult to upgrade, and requires extra attention.

$4,300, www.voodoopc.com

"I COULDN'T BELIEVE HOW FAST THE DELL XPS LAPTOP WAS. IT ACTUALLY BEAT THE BENCHMARK SCORES OF A DESKTOP PC WE REVIEWED IN THE SAME ISSUE!"
—GORDON MAH UNG, SENIOR EDITOR

the Area-51 laptop sported the Alienware logo on its topside; the eyes of the alien lit up when the power was on or the battery recharged.

In early May 2004, the company generated big headlines when it announced that it had developed a new 3D card technology that would offer up to 60% increases in gaming performance via a proprietary technology. Because this new technology would require enhanced case cooling, Alienware also created a new high-end label under which these PCs would be sold: ALX. We couldn't help but marvel at the boldness of this announcement: A former boutique PC shop creating a new boutique label?

Voodoo PC Innovates with the F50

Focusing on both good looks and screaming fast performance, Voodoo PC continued to make huge strides in 2003 toward establishing itself as a high-quality system integrator. The company's reputation gained big-time with the release of two innovative PCs: the ENVY

PC Testing In Depth: SYSmark 2004

This benchmarking app continues its trend of favoring fast CPU, lots of RAM, and bandwidth. The big change: More detailed reporting.

When BAPCo introduced the 2001 version of *SYSmark*, some benchmarkers were disappointed that the company eliminated a great deal of the detailed analysis that the program previously reported. While *SYSmark 98* used to tell you how long it took for, say, *Premiere* to run, *SYSmark 2001* threw away most of this data.

Although you still can't tell specifically whether it was *Dreamweaver MX* or *Premiere* that hurt (or helped) performance, at least you can now narrow your guess down to two or three apps and the type of usage behind scores. This allows us more insight for analysis when a PC system is throwing up poor numbers.

In addition to the Overall score, *SYSmark 2004* now reports 3D Creation, 2D Creation, and Web Publication; an Internet Content Creation score is based on these three categories. *SYSmark 2004* also breaks down the Office Productivity score into three dimensions: Communication, Document Creation, and Data Analysis. Our benchmark chart will continue to report the overall *SYSmark 2004* score, but we'll report details of the test runs when relevant.

More specifically, *SYSmark's* Internet Content Creation test includes the following tasks:

- The **3D Creation** score indicates how fast the tested machine can render a 3D model in *3ds max 5.1* while preparing a web page with *Dreamweaver MX*.
- The **2D Creation** score is based on how long a system takes to use *Premiere 6.5* to create and export a movie. This test also uses *Photoshop 7.01* and Adobe's *After Effects 5.5*.
- The **Web Publication** score is derived by using *WinZip 8.1* to extract a zipped file while *Flash MX* is used to open an exported vector file. The final movie is encoded with *Windows Media Encoder 9* and scanned with *VirusScan 7.0*.

The Office Productivity test includes

- A **Communication** score based on how well the system performs in *Outlook 2002* while *VirusScan 7.0* runs in the background. *Internet Explorer* is also used to view BAPCo's corporate website and browse files created by *SYSmark*.
- The **Document Creation** section involves editing a file in *Word 2002* and using *Dragon NaturallySpeaking 6* to dictate a document. The document is then turned into a PDF using *Acrobat 5.0.5*. Finally, *PowerPoint* is used to create a presentation based on the document.
- The **Data Analysis** portion of the Office Productivity test queries a database in *Access 2002*. These results are imported into *Excel 2002* and used to generate a graphical chart.

Overall, *SYSmark 2004* should be a reliable way to gauge the overall performance of a system, from RAM to CPU to hard drive.

CPU	2.2GHz Athlon 64 FX-51	2.2GHz Athlon 64 FX-51	2.2GHz Athlon 64 FX-51	1.6GHz Pentium 4E	3.2GHz Pentium 4E
SYSmark 2004	Dual Channel DDR400	Single Channel DDR400	Dual Channel DDR200	Dual Channel DDR400	Dual Channel DDR400
Overall	172	166	157	98	185
Internet Content Creation Overall	200	198	190	100	213
3D Creation	193	192	188	104	203
2D Creation	244	239	225	101	257
Web Publication	170	168	161	94	185
Office Productivity Overall	148	140	129	97	160
Communication	143	143	143	101	143
Document Creation	177	172	159	96	178
Data Analysis	127	112	94	94	161

***SYSmark 2004*, our favorite PC testing benchmark, features several much-needed enhancements.**

HyperSonic SonicBoom

This PC looks and moves like an angry bumble bee.

When it was released in late 2003, the SonicBoom shattered all our benchmarking records.

A sonic boom is the distinctive sound caused by the shock wave that precedes an object as it surpasses the speed of sound. This is exactly what happened when HyperSonic's markedly un-mellow yellow SonicBoom blew into our Lab and instantly shattered several of the benchmarks that we created just last month.

This came as no surprise to us because the SonicBoom is outfitted with Intel's ripping new Pentium 4 Extreme Edition. Yeah, the same CPU that took top gun against Apple's dual-2GHz G5 and AMD's Athlon 64 FX-51. To give the P4EE a little more juice, HyperSonic overclocked it a wee bit to 3.37GHz. We instinctively frown upon OEM overclocks, given a recent spate of such boxes that either didn't live up to the hype or couldn't be mass produced. But HyperSonic swears the OC is easy to replicate for any consumer who wants it, and claims to be able to fulfill all orders.

The SonicBoom's components are mostly state of the art: 1GB of Corsair Micro PC3200 RAM, a pair of Western Digital Raptor 10K SATA drives, an ATI Radeon 9800 XT card, a Pioneer dual-format DVD drive, and a Plextor Premium CD burner. The Abit IC7-MAX3 mobo features a unique cooling system that keeps its power regulation circuits cool—an important feature for overclocking and for future CPUs that will push the power circuits to the max.

Externally, the SonicBoom is quite fetching. Although the paint job isn't Falcon Northwest caliber, it's vibrant, professional-looking, and durable. On the inside, HyperSonic attached foam to the case's side door and sundry other empty spots in an attempt to dampen any noise the aluminum chassis might emit.

The real star of the SonicBoom is the P4 Extreme Edition. This Intel chip and its fat-ass 2MB L3 cache surpassed the competition in last month's CPU benchmark battle. The up-clocked P4EE did the same thing here, chewing its way through the application benchmark *SYSmark2002* with results that will only fuel AMD-believers' accusation that the test is biased toward Intel.

It's clear that HyperSonic invested a lot of TLC in its SonicBoom, and we appreciate that. While a few areas could stand improvement—a third drive for bulk storage, an Audigy 2 ZS, and a different cooling fan would all be welcome—you couldn't ask for more power from a modern machine.

Originally published January 2004

MAXIMUM PC VERDICT 9

YELLOW SUBMARINE
Pentium 4 Extreme Edition takes charge.

YELLOW SNOW
Overclocked CPU means no Intel warranty for your chip.

$3,983, ($3,384 w/o speakers and display)
www.hypersonic.com

m:370 laptop, which won a Gear of the Year award from *Maximum PC* in our December 2003 issue, and the intimidating, awesome-looking, completely silent Rage f50 (which is reviewed on page 145).

Dell Goes High-end with the XPS

Imagine our surprise when Dell, one of the biggest PC manufacturers in the world, threw us a massive curveball by delivering the fastest laptop we'd ever seen in early 2004. Built for gamers, the company's XPS laptop (reviewed on page 149) shocked us with performance numbers that actually surpassed several desktop PCs we had previously reviewed. One thing is for sure: The XPS gave us new levels of respect for Dell.

Go L

The subject of our controversial cover story in the January 2004 issue, L Computers garnered a considerable wave of attention from PC enthusiasts and from the mainstream and technically-oriented press when it launched its corporate web site late in 2003. Founded by Miguel Liebermann, a former TV commercial director turned enthusiast, the company made some big, bold claims regarding its first wave of products. The Mach L 3.8 PC, the company's web site promised, would ship with a full-fledged VGA LCD screen on the PC case itself, and would also utilize a massive (and quite expensive) "PuRAM" drive that would offer unparalleled performance.

Needless to say, almost immediately upon hearing L's claims, the Internet was abuzz with speculation regarding the fledgling company's legitimacy. *Maximum PC* received so many emails requesting that we

review one of L's systems that we requested and received an early prototype of the Mach L 3.8. Our impression of the early system was mixed; many of the promised next-gen components were missing, but the performance results were above average.

Time will tell whether L is the real deal and whether the company survives. Nonetheless, we can't help but think that as time goes on, the company's progressive vision for the future of personal computers will more than likely be felt across the PC manufacturing industry. After all, who doesn't think that a VGA LCD mounted on your PC's optical drive bezels is cool?

The New Trend: PCs for Gaming

It's no surprise that, at some point or another, almost everyone uses their PC to play games. So it's also no surprise that the big PC manufacturers like Dell and Compaq have begun to emulate boutique shops like Alienware and Falcon Northwest and create PC brands dedicated exclusively to gaming.

Dell's XPS line is a shining example of this strategy; every nuance of both the laptops and desktops in this newly created line are being built with high-end gaming performance in mind.

Invariably, the end result of these gaming-oriented endeavors is a system loaded with 1GB of memory, a Pentium 4 EE or Athlon 64 FX-53 CPU, a Radeon 9800XT videocard (which will soon become an nVidia GeForce 6800 or ATI Radeon X800), and a $4,000+ price tag. Hey, you gotta pay if you want to play.

The Other New Trend: A PC in Every Living Room?

One of the more interesting prebuilt PC trends of the last year has been the number of "Media Center" PCs released by all the major system manufacturers. Built to fit into consumers' living rooms,

Hornet Pro 64

If you're into small formfactor boxes and you're biased towards high-end videocards with the GeForce moniker, you probably already know the two don't mix well these days. Few SFF boxes can accommodate these cards' two-slot design. And no SFF machines we know of have the *cojones* to match the merciless power requirements of nVidia's new GeForce 6800 Ultra.

The Hornet Pro packs a fistful of power, with 10K RAID and nVidia's latest and greatest GeForce 6800 videocard.

But somehow, Monarch has managed to not only stuff a GeForce 6800 Ultra into its Hornet Pro 64, it has also integrated a bunch of other high-end components.

The GeForce 6800 Ultra is paired with AMD's brand-new Athlon 64 3700+ in a VIA K8T800-based motherboard. This equates to a smooth 2.4GHz of computing that's damn-near as fast as a FX-53 CPU in most tests. A pair of Corsair Micro DDR400 Pro modules light up to indicate memory access activity, while a pair of RAID 0 Western Digital Raptor 74GB 10K drives handle storage. Also new to the mix: Plextor's PX712A, a recent upgrade to our favorite multi-format burner—the Plextor PX-708A. Rounding out the hardware configuration is a Sound Blaster Audigy 2 ZS card.

The case itself sports a Ferrari red custom paint job that looks fabulous. None of this matters to gamers, though, so much as cold, hard performance results. This is a category where the Hornet Pro 64 doesn't disappoint. In our *Jedi Academy* OpenGL test, the Hornet Pro 64 gave us a Lab record 115fps. In *Halo*, the Hornet Pro coughed up an amazing 78fps, more than double our zero-point reference system. While it's not part of our official suite, we also ran *3DMark 2003* and recorded a shockingly fast 12,034. In *3DMark 2001 SE*, it threw down a 24,747. Needless to say, the nVidia GeForce 6800 videocard is one bad mutha.

In application testing, the Hornet performed well, but the 200MHz speed advantage of its Athlon 64 3700+ was nullified by the dual-channel capabilities of our zero-point Athlon 64 FX-51. With this said, Monarch's little red box posted 12 percent faster scores in our *MusicMatch* test, which measures a PC's ability to encode MP3s. While our software tests consistently demonstrate the power of Intel's architecture with regard to software performance—the Hornet ran behind our P4EE-equipped system—the Pentium 4 is considerably more expensive. In our mind, these savings justify Monarch's decision to go with an Athlon-based CPU.

Originally published July 2003

MAXIMUM PC VERDICT 9

MOHAMMAD ALI

A GeForce 6800 Ultra in a small formfactor box!

ALI G

Athlon 64 trails P4 in application tests.

$3,277, www.monarchcomputer.com

MAXIMUM PC KICK ASS PRODUCT

Dell XPS

This laptop leaves the competition in the dust!

The XPS looks like someone glued a docking port to it, but who says looks are everything?

Dell has crammed every top-end component into the XPS. Fastest processor? Check. The XPS has a 3.4GHz Pentium 4 Extreme Edition. Dual-channel DDR400? Check. 4x DVD burner? Check. Brand-spanking-new ATI Radeon 9700 graphics chip with 128MB frame buffer? Got it—and before the competition did. How about the hard drive? No less than Hitachi's new 60GB 7,200rpm hard drive. What about wireless? Yes, sir. Dell included every flavor known to man, and then added a Bluetooth transceiver and IrDA to boot. We've heard rumors that a CB radio license could be required to operate all the XPS's wireless transmissions at once!

"It's like a flat Shuttle box," one *Maximum PC* editor gushed while watching us play Ubisoft's system-stomping *Far Cry*. Indeed it is—this is truly desktop-level performance in a notebook. Dig the comparison: The XPS is actually faster than the Transformer-esque iBuyPower desktop system in *MusicMatch*, *Premiere Pro*, and *Photoshop 7.01*. In fact, only one machine has performed faster in these three tests: the 3.4GHz Pentium 4 Extreme Edition reference machine we built ourselves in March to benchmark the 3.4GHz P4 EE chip. That reference machine used a 250GB 7,200rpm Western Digital hard drive and an 875P chipset with low latency Corsair Micro RAM. In gaming performance, the XPS lost only two categories—*3DMark 2001 SE* and *Jedi Academy*—to the nVidia-equipped Alienware Area 51M, which is no slouch itself. In modern games, however, the XPS shines like the sun. In tests that stress various levels of DirectX pixel-shading capabilities, the XPS was unbeatable in *Halo*, *AquaMark 3*, and *3DMark 2003*.

Of course, while notebook graphics offer 10 times the performance they did a few years ago, they still don't come close to the performance of desktop graphics. This is what makes Alienware's GPU user-upgrades such an attractive option. Well, Dell also offers a solution. At your request, the company will send a technician to your home to upgrade your XPS for you. For a price of $400. Ouch.

So what's not to like about the XPS? One, it's expensive. And two, it's as fat as a New York City phone book. But bitching about size in a performance roundup would be akin to complaining about battery life; these days, you just can't get performance without sacrificing one, the other, or both.

If you want the fastest laptop in town, Dell's XPS is the only answer.

MAXIMUM PC VERDICT 10

SUREFIRE
No-compromise performance that's faster than most desktops.

MAGLITE
Just a little lighter and smaller than the anchor for the USS Enterprise.

$4,100, www.dell.com

these Media Centers resemble stereo receivers more than they do PCs. Using a special version of Windows XP—*Win XP Media Center Edition 2004*—these rigs are designed to function as an all-in-one TV tuner, TiVo-style personal video recorder, DVD player, gaming system, and music/photo server. (Whew!)

For the early adopters who purchased these first generation devices, the reality felt a little further from the truth. While we appreciated the media centers' multi-faceted functionality, we often found ourselves frequently frustrated by feature clash between the home theater and PC halves of these systems. Compounding these flaws, the early builds of this modified version of Windows XP were much less stable than any home theater device should ever be. "There's no crashing allowed on television!" we exclaimed, after missing Barry Bonds hit his 660th home run because our evaluation unit had crashed. For a more detailed look at the first two media centers we reviewed, turn to page 142.

Still though, after Lab-testing these systems, it became clear to us that, conceptually speaking, the notion of an all-in-one, PC-based home theater device is sound. TiVo and other PVR manufacturers had best look out—Microsoft appears quite intent on aggressively pushing the Windows operating system into the living room.

Looking Ahead: Pre-built PCs

The future promises more of the same for desktop PCs—power, speed, functionality, and multiple purposes.

Is this modder-inspired PC a vision of future pre-built systems to come? We think so.

As we've mentioned numerous times already, the fundamental architecture of numerous PC components will change dramatically over the next 12 months. This, combined with the re-casting of the PC as a living room and/or media appliance, should make for an interesting year for the pre-built PC market. Let's take a look at the highlights:

Next-generation PCs: In the coming months, we should begin to see the first "next-generation" PCs. Sporting DDR2 and possibly even BTX-based motherboards (which you read about in Chapters 3 and 4), these more ventilated, hyper-powerful PCs represent the future of PC design. We expect the baseline high-end PC of the near tomorrow to use either nVidia's GeForce 6800 or ATI's Radeon X800 and to feature at least 1GB of RAM and 250GB hard drives. How else are you going to play games like *Half-Life 2* and *Doom 3*?

While the increased airflow of the BTX spec should make for a cooler PC environment, as performance gets hotter and hotter, PC vendors will be forced to start incorporating more advanced airflow schemes and more active cooling devices into the systems they build.

One final note here: With Microsoft carefully plotting the company's next new iteration of Windows, code-named Windows Longhorn, for release in 2006, it's a sure bet that PC manufacturers are licking their chops in anticipation of selling numerous new PCs. Given the ambition level of Longhorn—which is rumored to boast a 3D interface, a powerful new file system, and numerous new features—it's likely that this new OS will be an unbelievable system hog, which will force millions of consumers to exchange their old PCs for new ones.

Media Center 3.0: The PC's foray into the living room has just begun. With this in mind, you can expect to see more elaborate—and hopefully more effective—designs by all

the major PC manufacturers. That means less noise, faster boot times, no crashing, and integrated wireless networking. We wouldn't be surprised to see a PC manufacturer like Falcon Northwest, Alienware, or Voodoo PC release a futuristic-looking small formfactor Media Center in the coming months.

Similarly, we also expect to see at least one of the major PC manufacturers—Dell, Compaq/HP, or Gateway—to jump into the media server market. As more and more PC enthusiasts network their homes in order to stream and share music, TV shows, pictures, and other forms of media, the notion of a central media server system becomes more and more appealing. This will also allow the big resellers to sell less powerful systems at dirt cheap prices. You don't need a whole lot of power to run your own media server—just a hell of a lot of hard drive space.

The Tablet PC: No Way!: Sadly, our take on the Tablet PC is that it will never evolve much farther beyond an awkward office note-taking device. Not until they're considerably smaller and boast vastly improved handwriting recognition. We've repeatedly tested these forward-looking gadgets and felt frustrated with their limited ability. Perhaps in two years this technology will move into mainstream America. But not anytime sooner.

How to Buy a PC Online

We present 10 essential buying tips for the ultra-defensive online shopper.

Choose the product, make, and model: Let's say you want to buy speakers, like, say, that nice Dolby Digital 11.1 Acme system you saw reviewed in *Maximum PC*. Make sure you note the specific model number of the system, and check out what other people who already bought the speaker system are saying at www.epinions.com.

Find the right price comparison site: When hunting for bargains, the first place *Maximum PC* editors go is www.pricewatch.com.

Check out the reseller ratings sites: Everyone knows about Amazon.com—it's probably one of the safest online retailers you'll ever do business with. But what about Happy PC Trader, Inc., or Gorgonzola Bros. Component Supply? You can learn details about their business practices at www.resellerratings.com. Just remember to look for patterns, and not give too much credence to any single individual review.

Check for gotchas: Everyone knows to be wary of hidden fees when shopping online. Here's a checklist to consider before actually buying the contents of your shopping cart:

- Are the shipping prices reasonable?
- Does the retailer charge a restocking fee for returns? How much?
- What's the return policy?
- If a product needs to be repaired, does the retailer pay for shipping one way, or both?
- Does the retailer have a customer service number? Dealing with email support can be a time-consuming nightmare.

If you can't glean the answers to all these questions from the vendor's website or over the phone, we say: Avoid at all costs (literally).

Check the company's privacy policy: Before you give up your email address, check the site's privacy policy. Does the site "share" (read: sell) your email address and/or purchasing information with others? Can you "opt out," in other words, decline to have your email address and demographic information given away to others?

Check for site security: Before you submit any personal or credit card information, look at the bottom of your browser window. Do you see a lock or unbroken key at the bottom of your browser, with the "https://" prefix in the address? This indicates the site is using a SSL (Secure Sockets Layer) connection, which encrypts data going to and from the retailer's servers. If a company can't be bothered to initiate a secure connection, well, it shouldn't be taking your money.

Use a credit card: Remember that many debit cards double as credit cards, and what you really want to use is a pure credit card. Not only do credit cards tend to limit your liability in cases of fraud, they also sometimes offer extended warranty protections. Plus, if something goes awry and Chechen rebels begin siphoning your account for fun money, wouldn't you rather have them drawing from a large credit institution instead of your personal checking account?

Chapter Twelve

Displays

With flat-panel screens rapidly gaining ground, are CRT monitors becoming a dying breed?

Dell's humongous LCD knocked our socks off. It wasn't perfect, but it came extremely close to matching the quality of our CRT standard. Our *Maximum PC* LCD Challenge taught us one thing: While flat-panels don't quite measure up to traditional monitors, they're *this* close.

If you think Hell is a 640x480 VGA monitor, just remember this: The very first computers had no graphics whatsoever—text was green and the background was black, and we loved it! Whatever display graces your desk is a work of art by comparison, for it gives you a clear picture into the digital world around you—every mouse move, every keystroke, every pop-up window, every confirmed frag.

Towards the end of the year, Sony announced that it was discontinuing production of the F520 CRT monitor. It was a sad day for *Maximum PC*—this display resided in our monthly "Best of the Best" section for three years.

Because they're built to last and because the core display standard has been exactly the same for over a decade, monitors have a delightfully long life in an age of disposable CPUs. And because their job is simply to reliably show you the information sent by the videocard, your monitor is blissfully uninterested in being upgraded to keep pace with your motherboard, your overclocking, or your $500 videocard.

The last year has been an exciting one in the display category, not so much because a slew of new technologies were introduced, but because of the development of several significant trends. Let's take a look.

The Current State of Display

The current state of the monitor and display market can be best summed up with three letters: L, C, and D. Over the last 12 months, as flat-panel displays became increasingly affordable and more viewable, consumers of all types began gobbling them up like there was no tomorrow.

Ever since our first issue, *Maximum PC* has relied on reader feedback to gauge contemporary trends in the PC market. We can always judge the level of interest in a certain technology, component, or product by the amount of email we receive from readers like you. (So keep writing!)

> ***YOUR MONITOR IS BLISSFULLY UNINTERESTED IN BEING UPGRADED TO KEEP PACE WITH YOUR MOTHERBOARD, YOUR OVERCLOCKING, OR YOUR $500 VIDEOCARD.***

Over the last 12 months, this feedback loop made one thing crystal clear: Readers have become more interested than ever in LCD displays. It's completely understandable; aesthetically, flat-panels add a certain sex appeal to your rig, be it PC desktop or laptop. Their sleek, futuristic looks and small footprint (the space a piece of hardware takes up) make them easy to love.

When combined with the constantly increasing visual quality of these displays, this visual and spatial appeal has combined with dramatic price drops to make LCDs a no-brainer for all but the most discerning consumers. In fact, in early 2004, we decided the visual clarity of flat-panels was close enough that we pitted eight LCDs against a state-of-the-art CRT monitor

The Great LCD Shootout

In our May 2004 issue, we created a *Maximum PC* challenge that set out to answer one critical question: Have LCD displays finally gotten to the point where they are equally comparable to traditional CRTs? To answer the question, we decided to use the one app that would separate the wheat from the chaff in our testing: 3D games.

We asked manufacturers to send us the best LCD they could offer to gamers. Many simply refused to do so, knowing, perhaps, that we'd be cruel if an LCD couldn't cut it. We put each monitor against Sony's 21-inch flat Trinitron GDM-F520 (a long-standing display in the monthly "Best of the Best" section of our magazine) for side-by-side testing.

A jury of three Lab staffers evaluated each display. We used *Need for Speed: Underground* and *Quake III* (rocket trails, anyone?) for testing. We used three gaming-specific criteria to draw a line between the two categories. First, we examined each LCD for evidence of ghosting, blurring, and smearing of images. These problems are associated with pixel response time, which is usually expressed as a combination of the "rise" (the time it takes in milliseconds for a pixel to go from black to white) and "fall" (from white to black). If pixels can't respond to changes fast enough, rounding a hairpin turn at 90mph in a racing game, for instance, will make the entire screen

Common Flaws in LCD Screens

These are the three key areas flat-panel screens are inferior to CRT monitors. Whenever we test LCDs, we check these categories with our games and standard LCD tests. How does your flat screen measure up?

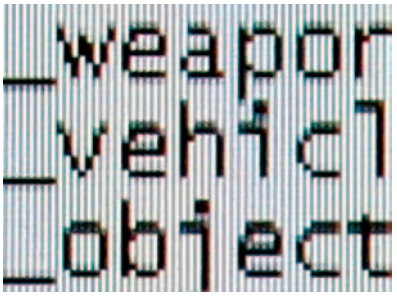
This is a perfect example of ghosting. Notice the smearing effect in the image on the right? We had to capture this image with a digital camera because it occurs after the videocard has processed the image.

Ghosting

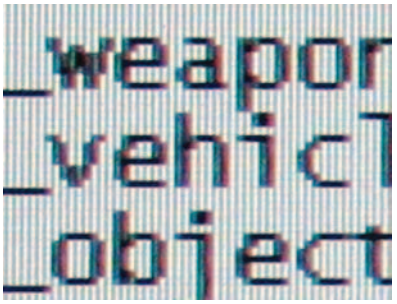
Ghosting occurs when pixels can't change their colors fast enough to keep up with your game. This results in a smearing effect, where bright lights against dark backgrounds appear to have trails, and a quick turn might leave a fading "ghost" image of what you were previously looking at.

Interpolation

Running games at anything other than your monitor's native resolution results in interpolation. The game expects to draw a red pixel at point A, for example, but point A falls in a spot where there are actually three fixed pixels at that location. An algorithm must decide where to put the red pixel, and what color or colors to fill the other pixels with.

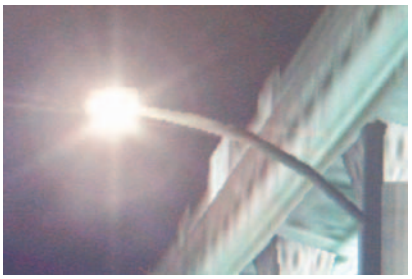


Good for gamers.



Bad for gamers.

Good for gamers.



Bad for gamers.

Brightness/Contrast

First- and second-generation LCDs were notorious for lacking brightness and contrast. Even today, only the very, very best LCDs can match the luminance of a CRT.

Samsung SyncMaster 172X

The 172X is roughly the same size and shape as Planar's PL170, but decidedly more sophisticated with its brushed aluminum shell and multipurpose stand. The 172X can either sit on a desktop where its hinged base allows forward and backward tilting action and minimal height-adjustment, or it can be mounted on a wall, where the hinge serves to pull the screen a couple inches out toward the user for closer viewing.

Samsung's 17-inch flat-panel display impressed us a great deal. If only it were a little bigger…

The monitor also comes with an arm mount option. Of course, the 172X's fancier stylings make it heavier than the Planar, but not by much. Samsung touts the 172X's "hidden controls," which reside on the underneath surface of the monitor's frame, but we prefer to have our buttons in plain view, where we can easily see what we're pushing. We have a more favorable opinion of the 172X's "hidden cable system," which confines all cables to a dock of easily accessible ports at the back of the monitor's base, and indeed makes for a comparatively cleaner look.

In our *DisplayMate* tests, the 172X consistently performed a notch above the PL170. Subtle differences in the grayscales were more evident and video noise was nonexistent. The 172X showed slight banding in screens of continuous graduated color, but the anomaly was isolated to just one or two areas of the display, and only at the darker ends of the color spectrum.

As an added bonus, the 172X features Samsung's patented MagicBright technology. Accessible via one of the six buttons on the monitor's control panel, MagicBright is essentially a shortcut to fiddling with the other control panel buttons. Simply choose the Text, Internet, or Entertainment option for a setting that has theoretically been optimized for that particular type of content.

Times New Roman text was comfortably legible at 9 point, and looked pretty good all around.

Originally published June 2004

SyncMaster 172X

MAXIMUM PC VERDICT 9

DISPLAY

Stylish frame, satisfying *DisplayMate* performance, good for gaming.

DISMAY

Limited height adjustment, "hidden controls."

$650, www.samsung.com

appear out of focus. This is tremendously hard on the eyes as they struggle to keep a lock on detail.

Next, we checked to see how well LCDs handle interpolation. LCDs have a fixed number of pixels; an LCD with a native resolution of 1280x1024, for example, has 1,310,720 hard-wired pixels arranged in its matrix. If you want to run a game at any other resolution, the LCD must interpolate pixels; in other words, to scale to a lower resolution, three pixels, for example, are made to appear as one. The effect on text (say, in a *Word* document) is devastating, looking something like the output from a manual typewriter. The effect is less noticeable in games, but there's an equally deleterious effect. Interpolation causes blurriness, which can be uncomfortable to look at and even nauseating after a while.

Finally, we measured each LCD's brightness and contrast. If it wasn't comparable to a CRT, it failed our tests.

Here are the results of our tests:

NEC 1980SX-BK

Despite 1600x1200 resolution and the option to swivel the LCD into portrait mode, NEC's 1980SX-BK didn't cut it. Images lost a tremendous amount of detail during quick movement, making fast-motion racing games and shooters a drag to play. At non-native resolutions, image quality suffered considerable degradation. We'd buy this extremely bright and sharp LCD in a heartbeat for illustration and editing work, but we'd go back to our CRTs after hours.

Our verdict: FAIL

Samsung 172X

One of the few LCDs in this challenge to receive a pass from every single participant, the 17-inch Samsung 172X dazzled us with both its high image quality and slick product design. Although there was some slight blurriness in *Need for Speed* compared with our test CRT, it wasn't obvious, and we were stunned at how little quality difference we could ascertain when playing at 1024x768 instead of the 172X's native res of 1280x1024.

Our verdict: PASS

Kogi L9CH-TA

Kogi didn't fare well in our tests of the L9CH-TA. We saw considerable smearing in high motion, and only one panel member would have even considered using the L9CH-TA

as a gaming monitor. Similarly, interpolation introduced a severe penalty, where oncoming headlights grew long tails and began to resemble meteorites. At least the brightness and contrast were fine.

Our verdict: FAIL

Viewsonic VP201s

Viewsonic got a pass—but just barely. At its native resolution of 1600x1200, the VP201s was spectacular; bright and crisp with nearly undetectable "ghosting" or blurring of images. But when we notched it down to 1280x1024, everything onscreen looked muddled and hazy.

Our verdict: PASS

Planar PL1700

Planar's PL1700 showed slightly more blurring of light objects against dark backgrounds than the Viewsonic, but on the other hand, it did a much better job of interpolating pixels at lower resolutions. We weren't sure why the Planar was analog-only, but it received a pass from our tough-minded panel.

Our verdict: PASS

Dell 2001FP

Our panel found Dell's massive 20-inch LCD to be spectacular. All panel members passed this one with flying colors (literally). Only a very slight amount of blurring was detected in high-motion scenes with bright lights against dark backgrounds, even with interpolation at 1280x1024! At its native resolution of 1600x1200, the 2001FP was among the sharpest and brightest LCD screens we tested.

Our verdict: PASS

Xerox 900

We used the Xerox 900 to demonstrate to other people in our office what "ghosting" is. The Xerox was easily the worst offender of the group, with terrible blurring during fast motion that made the screen look like it was made of rubber and being pulled in different directions. Interpolation resulted in severe degradation of moving images. Although it's a large and handsome unit, the majority felt that the Xerox's brightness and contrast were vastly inferior to a CRT.

Our verdict: FAIL

BenQ F9AH

The F9AH didn't get a thumbs up from any of our editors. Blurriness was pronounced, making *Need for Speed* look like a film someone was trying unsuccessfully to pull into focus. Image quality took yet

MAXIMUM PC KICK ASS PRODUCT

Dell UltraSharp 2001FP

On the surface, the 2001FP clearly has the edge. It's got a generous 20.1-inch viewable area with a 1600x1200 resolution, a handsome midnight-gray enclosure with silver accents, and an ultra-flexible neck that lets you not only tilt the screen forward and back, but rotate it to a portrait orientation (any videocard worth owning will let you configure the content on your display accordingly).

That display is HUGE! Dell's 20-inch LCD knocked our socks off.

Another benefit of the 2001FP's physical agility is that you can easily access the bounty of inputs that reside on the monitor's underside: DVI, VGA, S-Video, and Composite-Video—all at your disposal and ready to accept a variety of video signals. A picture-in-picture option lets you watch content from two different video sources—say, your PC and a TV—at the same time. Furthermore, the 2001FP can double as a four-port USB hub as long as it's connected to a USB port on your PC.

DisplayMate was the 2001FP's final hurdle. Here, Dell's monitor fared somewhere between the VGA-only PL170 and Samsung's 172X in the app's highly exacting image scripts. On the grayscale ramps, the 2001FP had more trouble at the darker end of the spectrum, where subtle differences in tone were harder to discern than at the lighter end. But, overall, the 2001FP performed well and text reproduction was laudable even in a serif font. In other words, we feel confident recommending this monitor for the vast majority of desktop chores.

With all of the 2001FP's fine features, its proven ability to withstand the rigors of gaming, and a reasonable price tag for its size, it's an undeniable value for desktop users and an obvious winner in our book.

Originally published June 2004

UltraSharp 2001FP

MAXIMUM PC VERDICT 9

SCREEN

Functional design, nice big screen, good gaming performance.

SCREAM

Less-than-perfect resolution of dark grays against a black background.

$900, www.dell.com

another big hit with interpolation. Even worse, most editors felt that the brightness, contrast, and color quality were inferior to even midrange CRTs.

Our verdict: FAIL

At the end of all our testing, our conclusion was clear: CRTs' multisyncing capabilities, which enable support for multiple resolutions, remain ideal for gamers, but LCDs could no longer be dismissed outright. Not a single editor on our staff wouldn't be happy cradling the Dell 2001FP or Samsung 172X on the way home to play *Battlefield: Vietnam*.

Sony Discontinues Its "Best of the Best" CRT

As further proof that the CRT market was rapidly ceding ground to flat-panel displays, in early April 2004, we received word—from a reader via email, no less—that Sony had discontinued its top-flight Trinitron GDM-F520. This flat CRT featured a 0.22mm aperture grille pitch and superb visual quality and clarity, which made us sad that it was no longer available.

It was like watching an old friend leave; for two-plus years, the F520 had graced *Maximum PC*'s monthly "Best of the Best" chart, which details the best possible products in each component category. It's discontinuation meant that we had to choose a new display for our "Best of the Best" CRT.

Contrary to our initial fears, Sony's decision to retire the aged F520 did not mean that the company was abandoning the CRT display market. When the company announced that the GDM-C520K would replace the F520, CRT purists everywhere breathed a sigh of relief. (To find out how the GDM-C520K fared, check out our review on page 158.)

Display Terms Defined

Aperture Grille: This is the typical "flat-screen" CRT, which uses a series of very fine wires suspended behind a monitor or TV screen that serves the same purpose as a Shadow Mask. Sony first commercialized the application of the Aperture Grille with its Trinitron line of displays. An Aperture Grille-equipped screen frequently displays more vivid colors and has no curvature on one axis.

Display Resolution: The number of pixels a monitor can display. Resolution is usually expressed in the form of a horizontal value followed by a vertical value. For example, a resolution of 1280x1024 means that the monitor can display 1280 pixels horizontally and 1024 pixels vertically.

Dot Pitch: The size of each colored phosphor dot on a screen. A small dot pitch allows for a sharper image. Dot pitch is usually measured in millimeters. For example, a dot pitch of 0.28 means that each phosphor is 0.28mm in size.

Grille Pitch: The width of each colored stripe on an Aperture Grille screen. Aperture Grille-based displays do not have phosphor dots, but rather phosphor stripes, and Grille Pitch indicates the width of each of those stripes (thinner is better).

Pixel Pitch: The size of each colored pixel on an LCD or plasma display.

Pixel Response: The time needed for a pixel to change color. A slow response time can lead to "ghosting" or blurriness when the picture changes rapidly. CRTs traditionally have very fast response time, whereas LCDs are much slower in this respect.

Refresh Rate: The number of times a screen is redrawn in a second. A high refresh rate is necessary for producing a flicker-free picture with a high resolution. Refresh rate is usually measured in kilohertz (KHz), with the lowest acceptable value being 60KHz.

Shadow Mask: A piece of metal behind a color monitor or TV screen that ensures that the electron beams hit precisely the right spots on the screen's phosphor. A Shadow Mask CRT is typically bulbous in shape.

Viewing Area: The diagonal length across a display's screen where images can actually be displayed. This term can be misleading because it is a length rather than an area. For example, a 17" monitor may only have a viewing area of 15.1."

Sony GDM-C520

Like its predecessor, the F520, Sony's C520 cuts a handsome figure. Its 19.8-inch diagonal viewing area is perfectly flat, anti-reflective, and attractively framed in an elegant cabinet that can be had in one of three shades of gray.

Also like its predecessor, the C520 is priced for people who are serious about CRTs. These days that usually means graphics professionals (if not hardcore gamers), so the inclusion of an attachable hood to keep out environmental light, as well as a proprietary hardware/software color-calibration system presumably make this monitor worth a premium.

In early 2004, Sony discontinued its F520 display, which had been a mainstay of *Maximum PC*'s "Best of the Best" list for years. Fortunately, the C520 is a worthy successor—although not necessarily the best.

Performance-wise, the C520 is pretty much on par with NEC's FE2111, which is a good thing. In our standard battery of *DisplayMate* tests (www.displaymate.com), the C520 proved more than competent at reproducing fine variations in grayscales, maintaining geometric linearity at even the far edges of the screen, preserving color purity and uniformity, and sustaining focus, sharpness, and resolution of intricate patterns.

The C520 also did well with color registration, though the interlocking lines of red, green, and blue were slightly disjointed at the edges of the screen, but not to any degree that would be noticeable in most circumstances. As for text legibility, Times New Roman (a serif text) was legible at 9-point, and comfortably readable at 10.5-point, but not quite as crisp as with the FE2111. The difference was even more pronounced when we switched our res from 1280x1024@75Hz to 1600x1200@85Hz—the resolution recommended by both CRT makers.

One of the F520's claims to fame was its 0.22mm grille-pitch—the finest consumer CRT grille-pitch known to man. So it's curious that Sony went with a more common 0.24 grille-pitch in its new C520 model; and it might explain why this time around Sony's CRT isn't stomping the competition.

Originally published July 2004

GDM-C520

MAXIMUM PC VERDICT 9

SEEN

Crisp, clear, and color-accurate image quality.

HEARD

Pricey, and less-than-perfect text reproduction.

$1,800, www.sonystyle.com

"I THOUGHT ALL THE LCDS WE COMPARED TO OUR HIGH-END CRT WOULD SUCK, SO IMAGINE MY SURPRISE WHEN FOUR OF THEM PASSED THE MAXIMUM PC CHALLENGE."

—KATHERINE STEVENSON, MANAGING EDITOR

MAXIMUM PC KICK ASS PRODUCT

NEC MultiSync FE2111

If it were a contest between cabinets, the C520 would win—at least compared with the plain-Jane beige FE2111 we received. Luckily, NEC also offers black as an option. But of course, what really matters is what's on the screen, not what's around it, and in this respect, the FE2111 excels.

We were so impressed by the FE2111's quality display that we didn't even notice the boring beige case.

It performed admirably in all the various *DisplayMate* tests without requiring any adjustment of the monitor's controls. When viewing a pattern of white squares atop a black background, there was some faint evidence of halos at the edges of the screen, which is where a CRT's image-quality is most fallible. But we didn't notice any such anomalies in other test screens.

In the color registration tests, the FE2111's performance was superb. The interlocking lines of red, blue, and green were virtually seamless across the entire display, demonstrating dead-on convergence of the CRT's primary color beams. As noted earlier, the FE2111's text reproduction was superior to the C520's to various degrees, depending on the resolution. Mind you, Sony's monitor was outfitted with its special hood throughout our comparisons. Even still, the FE2111's output looked as good, if not better—in *DisplayMate* and in side-by-side viewings of several high-res digital images. And while the FE2111 doesn't come with a fancy calibration system like Sony's, we never really felt the need for one. Of course, graphics professionals may feel otherwise; for them the ability to adjust for prepress specs might be ideal and well worth the price. For us, the NEC FE2111 does the job beautifully and its superior handling of text pushes this monitor to the top.

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MultiSync FE2111

MAXIMUM PC VERDICT 9

VISAGE

Beautiful image quality and text reproduction.

MIRAGE

Beige cabinet is uninspired.

$600, www.necmitsubishi.com

Multi Monitor Displays Take Off

Regardless of your affinity for CRTs and LCDs, the other big trend we've witnessed during the course of the last year has been a steady migration of power users toward multi-monitor displays.

Why the extra monitors? Logistically, it's simple: Monitors last a lot longer than the PCs we buy them with, so it's not rare for a person or family to accumulate multiple displays over the course of five or seven years. And if you have 'em, you might as well use them, right?

It would be similarly easy to argue that hardcore PC fans have added an extra CRT or monitor to the mix in order to impress their friends or peers. But this power-user setup is not just for show. The reality is that doubling the number of screens doubles the size of your Windows desktop, which can dramatically increase your productivity.

Imagine that you're writing a story, article, paper, or email. With two screens, you could type on one side, and do Google searches, refer to your notes, or check your fantasy baseball team's scores on the other. Now that's productivity!

Windows XP enables the easy usage of two or more screens; support for multiple displays is built into the OS.

Always ahead of the curve, several *Maximum PC* editors embraced this developing trend early in the year. Editors Gordon Ung, Will Smith, Josh Norem, and Editor in Chief George Jones all added an extra LCD display to the CRTs already in use at their high-end workstation. In most cases, the extra screen was an LCD that complemented an existing CRT. This provides the best of both worlds; a high-quality, multi-resolution display and a sleek, sexy-looking flat-panel.

Editor Will Smith even took the multi-monitor madness to another level by adding a third screen to his desk; the end result was a massive display that instilled shock and awe into all who sat before it.

Planar PL170

The 17-inch PL170 was the least expensive of all last month's challengers, and one of just two that sported a VGA-only interface, so it's a triumph simply that it's come this far. The PL170's appearance is unassuming, to be sure. The plain black plastic chassis is nothing to write home about, but also utterly inoffensive. The five black control buttons on the monitor's frame are so low-profile as to be difficult to see and ambiguously labeled. And the PL170 won't win any contests with its moves, as it's able to tilt just slightly forward and back on its base, but that's it.

We were puzzled by the Planar LCD's usage of an analog display adapter.

It's quite likely the PL170 is disadvantaged by its VGA interface. After all, the conversion from digital to analog inherent in VGA introduces an additional process to data transmission that the DVI-ready Samsung and Dell monitors don't have to mess with. This distinction was most obvious in the *DisplayMate* screen that tests video noise. A screen that should have appeared absolutely stationary showed distinct interference on the PL170, though we were able to minimize the noise via the Auto Adjust setting. We also noticed obvious vertical banding on the PL170 when looking at swaths of continuously graduated color, particularly at the dark ends of the color spectrum.

For image-quality tests, we turn to our standard ally *DisplayMate*, a compilation of various test screens designed to expertly evaluate an LDC monitor's performance. Whereas our game tests of last month were focused on issues of ghosting, interpolation, and color-contrast in action-packed graphics, *DisplayMate* isolates specific qualities in a way real-world apps can't. For instance, when looking at a graduated series of gray boxes against both white and black backgrounds on the PL170, we had trouble distinguishing subtleties at the extreme ends of the scale. In other words, very light grays looked white, and very dark grays look black, though not to any degree that would make it unusable for most applications other than image editing.

Serif text was comfortably legible at 9-point and greater, on both dark and light backgrounds, but appeared a tad fuzzier than the text on the other two monitors—another shortcoming we attribute to the PL170's analog signal.

Originally published May 2004

PL170

MAXIMUM PC VERDICT 8

SEEING

Inexpensive, good gaming performance, acceptable image quality for most applications.

SEETHING

VGA interface, inflexible neck, banding problems in *DisplayMate*.

$460, www.planar.com

HD Flat-Panels

Interestingly, we began testing the slew of flat-panel displays just as the first major wave of Media Center PCs began to emerge. As you (hopefully) read in Chapter 11, these Media Center boxes are built for the living room. The OS for these systems is a modified version of Windows XP, which allows users to use their PC to watch and record TV in a TiVo-like fashion as well as watch DVD movies and play music files.

In a "your chocolate is in my peanut butter" kind of moment, we hooked up a few of the LCDs we were testing to the Media Centers and discovered something interesting: flat-panel screens match up perfectly with them.

While none of the currently available Media Centers provide HDTV capabilities, the size, brightness, and resolution of the current flock of LCDs make them perfect for watching DVDs and non-HD cable, satellite, or broadcast TV.

When LCDs get a little bigger and Media Centers gain HD capabilities, we'll be onto something.

MaxiVista: An Innovative Display Solution

In our June issue, we reviewed *MaxiVista*, an innovative application that allowed PC users to create a multi-screen rig without spending a lot of money, by harnessing the screens of old laptops to create a crude multi-monitor set-up.

"Think of it as Windows XP's Remote Desktop or Symantec's *PCAnywhere*", we expressed. "But instead of sending a duplicate of your PC screen across the Internet, your second machine simply gets

enlisted as an additional desktop display. All you had to do was connect the two machines via a crossover cable (or to the same hub), install *MaxiVista* on the primary box and a small client on the second machine, and you were good to go. Only cable length limited the distance between the two monitors—something that couldn't be said of a videocard.

We used *MaxiVista* to slave an old notebook to our Tablet PC and were pleased with the results. We also ran the app on a notebook with our dual-monitor desktop serving as a slave for a tri-monitor setup, with positive results. Playing games, however, wasn't so great on the virtual display; in fact, *MaxiVista* wasn't really useful for tasks more complicated than web browsing or displaying RSS feeds or IM clients. This is because of an Ethernet cable's relatively slow transfer speeds compared with the high-bandwidth connection of a standard monitor cable.

Using *MaxiVista* felt like using a monitor without hardware acceleration. When we tried to rapidly move a window around or scroll through a document at high speed, our display wobbled like Jell-O. Additionally, without hardware acceleration, we were unable to watch DVD playback without severe image degradation. Smaller media files played fine, though.

But still, while *MaxiVista* isn't for everyone, we were impressed. We deemed it a pretty nifty way to make use of an old laptop by turning it into a third (or fourth) monitor for your PC setup, and gave the product an 8 out of 10 rating.

At press time, *MaxiVista*'s developer of the same name was even working on a free update that would allow the use of more than one additional monitor.

How to Set Up a Tri-Monitor Display

Install a second videocard and add a third monitor for mondo screen real estate!

Ingredients: You'll need three monitors, an AGP videocard with dual outputs, a PCI videocard, and an operating system that can cope with multiple monitors. We've found that PCI GeForce2 MX cards will work with just about any other mainstream card, and Windows XP has the best operating support for multiple monitors.

- Before you install the PCI card, we recommend you download the video drivers for the PCI card, and store them someplace you'll be able to find them later. Then shut down your PC, install the PCI card, and reboot. Connect monitor cables to each output on the videocard. Make sure that the monitor you want to use for gaming is connected to your AGP card.
- Boot into Safe Mode by repeatedly pressing F8 from the time you power up the computer until you see the Safe Mode menu. Once Windows has started up, install the drivers for your PCI videocard. Once the drivers are installed, reboot the PC and boot into Windows.
- Once Windows starts, you'll need to enable the second and third monitors. Go to Start, Control Panel, Display, and click the Settings tab. Right-click each of the grayed-out monitors and click Attached, then click Apply. Click Identify, then drag and drop the monitor icons on the Control Panel until the displays on screen are arranged in the same way as your physical monitors. From this panel, you can also adjust the resolution and refresh rate of each monitor.
- If you're having problems getting your system up and running again, you may need to make a slight BIOS adjustment. First, enter your BIOS and go to the Init Display First setting—it's usually in Advanced BIOS settings. It should be set to either PCI or AGP. We've found that some systems require that the PCI display initializes first, while others require the AGP display to initialize first. You'll have to experiment a bit.

Looking Ahead: Displays

Our prognostication can be best summed up by an equation: Bigger and more = better.

Is this wraparound display the future of multi-monitor setups? We hope so.

Okay, if you haven't picked up on this by now, we'll put it out there one more time: If you don't have multiple displays by the end of 2005, you're going to sit squarely in the middle of the technology curve. Is that any way for *Maximum PC* readers to live their lives? No. No, it is not.

But aside from this, what do we see for the future of displays and display-related technologies? Great things. In fact, we'll put money on this bet: When it's 2010 and we all gaze back in time, the pundits will unanimously decide that the pdisplay—be it LCD, CRT, plasma, or some other technology—was the most important technology of this decade. By then, displays will be everywhere in our lives. And we mean everywhere. But in the shorter term, here's what we see.

LCDs

Over the course of the next two years, we expect to see CRT-like quality levels in more and more LCD screens. Consider it inevitable. The turning point, when flat-panel display becomes equal in quality to bigger, bulkier monitors, will come when LCDs are able to switch to non-native resolutions with no discernable image degradation.

As this shift gradually occurs, it's inevitable that, over the course of the next two years, more and more PC users will make their next displays flat-panel screens. For many consumers, the plummeting prices and marked increase in quality will increasingly justify their purchase. This isn't even taking into account the smaller size, portability, and perceived sexiness of these displays.

This isn't to say that CRTs are going away (more on this later), but it will be hard to pass up a 21-inch display that costs half as much as a CRT monitor.

This popularity will extend beyond the office or desk. LCDs (and their more sophisticated plasma brethren) will begin to replace more depth-challenged display devices as second and third televisions. Their innate ability to display the higher resolutions that HDTV broadcasts and PCs require will make them more popular.

Multi-monitor Displays

This gradual shift will result in more and more desktops and workstations becoming dual-display rigs. Like we said earlier, CRTs last a long time and are hard to get rid of, so why not use them?

As human beings increasingly become more comfortable with multi- and hyper-tasking, we'll also become more accustomed to using two and even three display devices. For us, this is an inevitability. Particularly at the workplace, which is becoming increasingly conscientious of worker productivity.

With this in mind, we expect to see more and more "wrap-around" displays, which combine the functionality and spaciousness of two- and three-screen setups, but without the disruption that the frames between multiple screens create.

CRTs

It's clear that the big, bulky CRT monitor is on its way to becoming displaced in the workplace and at home, but don't count the traditional monitor out just yet. In the future, we see this more traditional display becoming more specialized.

Because of its adjustability and consistently high quality levels, the CRT will begin to serve and function as a reference display. We expect to see it used forever in art- and design-intensive applications such as game design shops and television studios.

After all, someone has to use 'em.

> ***"IF YOU'RE NOT MULTI-MONITORING, YOU'RE NOT REALIZING YOUR TRUE PRODUCTIVITY POTENTIAL."***
> ***—KATHERINE STEVENSON, MANAGING EDITOR***

Chapter Thirteen

Mice & Keyboards

Highly evolved and exquisitely comfortable, PC mice and keyboards withstand hours of daily pounding with nary a negative effect.

With repetitive stress injuries increasingly becoming a concern, it's more important than ever that you find the right keyboard for you.

It's all about the keyboard. Taken for granted for far too long, and the cause of all too many injuries because of this, the base function of a keyboard is to permit rapid typing speeds while preventing error. Secondary functions include allowing us to navigate to frequently used applications and functions in a hurry.

One of the more unique mice on the market is Razor's Boomslang gaming mouse. It's low-to-the-desk profile and funky shape have been the source of numerous ergo-related arguments in the *Maximum PC* Lab.

Keyboards are not just for typing anymore. They're complete interfaces to PCs and Windows unto themselves. We are so accustomed to using them and they're such a fast means of entering any form of words, content, or data that we'll probably be using them forever in some way, shape, or form. We'd bet two thousand bucks that sometime over the next two years, people begin using a keyboard-display interface in their living room.

Because many people are in front of a computer and keyboard for long stretches of time, they have different preferences as to what they'd like to see from their keyboard. As a result, many different types are available. When it comes to buying one, power users, like serious athletes, are often picky, but loyal to specific makes and brands.

We've proselytized about the importance of every single component in your PC, and the mouse and keyboard are no exception. Think about it: The right keyboard can keep you merrily typing away after 10 hours at the office (we know this all too well). The wrong keyboard can put you in the hospital. The right one can delay muscle fatigue and repetitive stress pains in your arms and hands. Similarly, a high quality mouse can make you a badass gamer; the wrong mouse will have you serving snacks to your compadres after they've owned you in deathmatch.

For such standard and often taken-for-granted devices, there are a surprisingly large variety of keyboards and mice available to consumers. This makes it difficult to choose the right one. We'll explore the ways you can find the best mouse/keyboard for yourself in a few pages, but before we get into that, let's take a look at the different types of mice and keyboards on the market today, as well as some of the trends in design over the last year.

Trends in Mice

A slew of mice get released by a slew of manufacturers every single year. These are the major categories:

- **Wired**: Your standard, run-of-the-mill mouse. Wired mice used to be broken into two categories—standard and ergonomic—but over the course of the last few years, almost every mouse released is ergonomic in some way, shape, or form.
- **Wireless**: Often paired with a keyboard, these mice transmit data via an infrared or—more commonly these days—RF (radio frequency) signal. Over the last year, we've even seen a few Bluetooth-based mice. Not all wireless mice are created equally, however—many create ungainly lag, which can affect gaming performance.
- **Scrolling**: Most mice released over the past year have scroll wheels that allow you to scroll a window up or down. Lately, we've even seen scrolling wheels that allow you to tilt the scroll wheel left and right.
- **Gaming**: An increased emphasis on ergonomics, rapid high-resolution tracking, and easy-to-reach buttons is the calling card of the gaming mouse.
- **Trackball**: These aren't really mice, *per se*, but are extremely popular with graphic designers and others who need more precision in their mousing. These types of input devices are also popular with people suffering from repetitive stress injuries, because you have to move your arm much less than you do with a more conventional mouse.

Over the past year, we haven't seen a great deal of evolution in PC mice. Ergonomically speaking, we've been very happy with the current comfort levels of

> "THE WRONG KEYBOARD CAN PUT YOU IN THE HOSPITAL."

MAXIMUM PC KICK ASS PRODUCT

Microsoft Intellimouse Explorer 4.0

Sleek, silver, and black, the Intellimouse Explorer 4.0 glides across our desks like a mighty salmon slicing upstream against rapid currents. With five buttons and a wheel, Microsoft's latest mouse offers the features we've come to expect, but this wired beauty adds a little something that helps up our ante in deathmatch.

Until someone writes a hack that allows us to use the Intellimouse's tilting scroll wheel with first-person shooters and RTS games, we're stuck using it in double-wide spreadsheets. Help!

The Intellimouse 4.0 uses the same 800dpi sensor that makes Logitech's MX700 and MX900 offerings so special. The sensor tracks the mouse's every movement without the slightest hitch, regardless of the surface texture or the speed the mouse moves at. It's truly an optical marvel.

Then there's the Intellimouse's new scroll wheel, which is loaded with potential. In addition to spinning forward and back, like every other mouse wheel, the Intellimouse includes a gizmo that lets you tilt the wheel from side to side. We suspect that this feature is practical and handy for double-wide spreadsheets and the like, but we plan to use the hell out of it in games, either to scroll through our inventories or to peek around corners. Unfortunately, we have yet to find any games that the tilt wheel works with. Official support is likely forthcoming, but some enterprising software hacker will surely write an applet to make it work before then.

The scroll wheel's most notable feature is its smooth-gliding motion. While most mouse wheels have a notched motion, the new Intellimouse wheel has absolutely no detents. It takes a little getting used to, but we found this new click-less sensation to feel superb. It also allows accelerated scrolling; the faster you spin the mouse, the faster you scroll through your weapons. Or browsers. Or spreadsheets.

Two of the buttons are placed on the left side of the mouse, near the top. This is great placement if you want to map them to frequently used functions, like push-to-talk or the Delete key, because it's difficult to press them accidentally.

If you're not a fan of Logitech's current line-up of teardrop-shaped mice, head over to your local computer retailer and give the Intellimouse Explorer 4.0 a test drive. It's a great mouse, whether you're a hard-core gamer or a spreadsheet jockey.

Originally published January 2004

MAXIMUM PC VERDICT 10

+ SPEEDY GONZALEZ

Perfect sensitivity, a great button layout, and the new über scroll wheel is rad.

– MIGHTY MOUSE

It isn't wireless, but some would call that a plus.

$40, www.microsoft.com

mouse bodies. Apparently the mouse makers are happy too, because we saw very few changes of shape or size in this category.

One big trend that we heartily endorse is the increasing popularity of wireless mice. Over the last year, more and more consumers have reached for RF- or Bluetooth-based wireless mouse/keyboard combos. If you've ever wrestled with your mouse cable, you know why. One other contributing factor to the increased sales of de-wired is the big leap in optical tracking. Five years ago, most mice on the market relied on a hard, rubber ball to track and move the cursor on the screen. These days, almost every mouse uses an optical sensor. Over the last 18 months, the technology behind these optical sensors has improved dramatically, to the point where you can move your mouse as fast as you possibly can, and the optical tracker never jumps, skips, or bounces.

As finely evolved as the mouse is, one area this input device can improve in is the location and functionality of the mouse buttons themselves. It seems that mouse makers have begun to pick up on this potential as well; we saw a few mice over the last year that featured interesting new mouse buttons. As an example, Microsoft's new Intellimouse has a scroll wheel that you can tilt left and right to scroll windows horizontally.

MAXIMUM PC KICK ASS PRODUCT

Logitech Cordless Desktop MX for Bluetooth

The Cordless Desktop MX's stylish charcoal and silver design will catch your eye, but its fully operational Bluetooth stack will capture your heart.

Last month we reviewed Microsoft's unremarkable Wireless Optical Desktop Elite. This month we tested the new Logitech Desktop MX for Bluetooth. At first glance, this package seems indistinguishable from Microsoft's offering, but it actually offers a power user much more.

Instead of using a proprietary wireless protocol to communicate with the mouse and keyboard, Logitech's devices use a fully featured Bluetooth stack. In addition to the profiles that make the mouse and keyboard work, the Desktop MX includes a host of other official Bluetooth profiles. This means you can use the included stack to connect your cell phone, PDA, and even Bluetooth headset to your PC—wirelessly!

The mouse and keyboard are similar to two existing Logitech products, the MX700 wireless gaming mouse—a *Maximum PC* favorite since 2002—and last year's Elite keyboard. The likenesses are more than external. The mouse uses the same 800dpi optical sensor, which transmits movement information fast enough for even demanding gamers. The keyboard includes 13 user-configurable hotkeys, a volume knob, a scroll wheel, and the same "improved" function keys that annoyed us last year.

If you're unfamiliar with the keyboard's offending feature, know this: The F1 through F12 keys have been remapped to common Windows tasks, such as opening new documents and printing. To reclaim the default functionality of the F-keys, you need to press the F-Lock key. This would be a great feature, except that many motherboards require you to press F1 or F2 to get into the BIOS. With today's fast-booting BIOSes, you have approximately 1/10th of a second to press the F-Lock key and then the key to enter your BIOS before the window of opportunity has closed. This could easily be remedied if Logitech set the F-keys to their default behavior and required a user to press F-Lock for the remapped Windows tasks.

The mouse sports rechargeable batteries, but the keyboard uses four standard AA batteries. Battery life on the mouse isn't as good as with the MX700, but a single charge will last at least two days.

We'd say Logitech has a wireless winner on its hands with the Cordless Desktop MX for Bluetooth.

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MAXIMUM PC VERDICT 9

+ WAYLON SMITHERS

A solid-performing mouse and keyboard tempt us, but the Bluetooth adapter seals the deal.

– OLD MAN WINTERS

The new "improved" F-keys still annoy the hell out of us. Change is bad!

$180, www.logitech.com

Trends in Keyboards

As important as mouse design is, keyboard design is even more critical. After all, unless you only use your PC to play games, you'll spend 20 times as much time typing on your keyboard as moving your mouse around. Given the increasing concerns around carpal tunnel syndrome and other repetitive stress-related injuries and the dramatically increasing average worker productivity around the globe—basically a fancy way of saying that we're all working harder than we ever have—comfort using the keyboard is paramount.

Ten years ago, keyboards were similar to Henry Ford's original automobiles: You could have any one you wanted, as long as it was beige and uncomfortable. These days, however, no matter what style of typist you are, it's a lock that there's a keyboard out there that will work well for you. These are the most popular forms of keyboards on the market today:

- **Normal**: This is your standard, plain-jane keyboard, which maintains a close resemblance to the original keyboard. No fancy ergonomics, extra buttons, or increased functionality here.
- **Split**: With an eye toward increased comfort for longer amounts of time and more efficient—and healthy—typing, keyboard manufacturers split the keyboard right down the middle. Typically, the keys in this layout are placed on a gentle slope, which allows for maximum ergonomic effect.

- **Extreme Split**: Some keyboards are split even more dramatically than usual. Whereas keyboards such as Microsoft's Natural Keyboard split the keys for increased comfort, some extreme versions take the notion of "split" more literally, and physically separate the two halves of the keyboard.
- **Enhanced functionality**: In an effort to add functionality to the keyboard, manufacturers have added one-touch shortcuts to *Windows Media Player*, email, *Internet Explorer*, and other applications. Microsoft's Multimedia and Internet keyboards fall into this category.
- **Wired**: Standard PS/2 or USB cables connect these keyboards to the PC. In some much-appreciated cases, these keyboards even feature one or two extra USB ports on back or top of the keyboard.
- **Wireless**: Similar to the wireless mouse—and often paired with one—the wireless version of this input device relies on RF or Bluetooth wireless connectivity.
- **Specialty**: This category includes keyboards for PDAs and other special functions, such as rubber, high-durability keyboards for mechanics.

While we're enthused at the progress PC mice have made, the *Maximum PC* Lab found itself disappointed at the developments in the keyboard category over the last year. Whereas the average mouse became more functional and refined, the average keyboard was stripped of features and functionality.

As an example, last year we reviewed a few keyboards by Microsoft and a few other companies that boasted one- or two-port USB hubs placed on the front or side. Over the last year, however, we didn't see very many of these mini-hubs. What a bummer—plugging your digital device into

BenQ x120 Internet Keyboard

Available in either silver and grey or standard PC cream, the BenQ x120 keyboard is awesome, whether you're a touch typist or a hunt-n'-pecker.

We don't often review basic keyboards these days. After all, they usually cost less than $20 and are readily available to try at major retailers like Best Buy and CompUSA. But we made an exception for the BenQ x120 keyboard; its features are unique enough to earn it a spot in our review section. Its small size and slim profile make it ideal for LAN-party totage, and you certainly won't be ashamed of its spiffy silver and grey stylings.

Our main consideration when reviewing a keyboard is its layout. Keyboards must use the standard layout that touch typists—from expert to novice—have come to expect. That means all the number, letter, punctuation, modifier, and command keys need to be exactly where your fingers expect to find them. If they aren't, you'll quickly become frustrated when you try to type. Fortunately, the x120's keys sit exactly where we expect to see them.

We also love to see at least a few nonstandard programmable keys. We've seen so many fancy, newfangled keyboards lately that it's difficult to imagine one without volume controls and a mute key. The x120 doesn't include multimedia keys, but it does have a few programmable "Internet" keys at the top of the keyboard. Sadly, they can't be reprogrammed to handle even basic multimedia functions.

The x120 offers good tactile feedback, making each press of the key obvious to the touch, which helps you avoid missed key presses, double taps, and other annoyances. And while it includes the new F-keys that have been the scourge of our recent keyboarding experiences, it's not implemented as awkwardly as we've come to expect. On newer Microsoft and Logitech keyboards, the F-keys are automatically remapped to common tasks like Undo and Save. The catch is that when you need to enter your BIOS, you have to scramble to press the F-Lock key to revert to the F-keys' original functions, and then press the F1 key. It's an unnecessary nuisance and we appreciate BenQ's approach: The F-keys all operate at their original capacities until you press the F-Lock key to implement the remapped features.

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MAXIMUM PC VERDICT 8

HOME

Slim keyboard design performs perfectly. F-keys perform as they should.

END

The low profile of the keys may feel awkward to some typists.

$25, www.benq.com

your keyboard is much easier than bending down and plugging it into the front or back of your PC. Our theory around this development is that it costs too much money, and that the keyboard manufacturers would rather spend development dollars on special multimedia and Internet buttons than USB ports.

While on the topic of special key functions, the other big negative we discovered this year was the F-Lock key. In an attempt to add functionality to the keyboard beyond the slew of one-touch shortcuts mentioned above, keyboard makers such as Microsoft and Logitech co-opted the use of the F1–F12 keys at the top of the keyboard. Windows-related functions such as copying, pasting, saving, and loading were assigned to these keys. We appreciated the development; aside from wonky boot-related functions such as entering the BIOS and changing boot modes, these F-keys have been historically underutilized in the Windows environment.

Unfortunately, the implementation of this new feature frustrated the heck out of us. Rather than requiring the user to enable these enhanced functions, these new keyboards had it turned on by default. To access "normal" F-key functionality, you had to press the "F-Lock" key. This means that if you need to enter the BIOS, you have to quickly press F-Lock (which often requires you to also press the "Control" key) and then press F8 to enter the BIOS. That's frustrating—and often requires a time-consuming reboot because it's easy to forget you have to press F-Lock in the first place.

Despite all this belly-aching, modern PC keyboards are far superior and much more functional than they were 5 and 10 years ago. One keyboard-related refinement we appreciate is that we're beginning to see keyboards customized for particular kinds of projects. In early 2004, for example, we received a consumer-oriented keyboard by Bella Corporation that was painted and constructed with video editing in mind. It even came with a jog dial mounted in the bottom left.

How to Find the Right Mouse and/or Keyboard

So, if you haven't already, take our advice: please, please, *please*, dump the craptacular $3 mouse and $10 keyboard that came with

Nyko AirFlo Mouse

Those holes on the side aren't for speed. No siree. They're part of AirFlo's state-of-the-art palm ventilation system.

At first glance, the AirFlo mouse looks like nothing more than a standard three-button optical mouse. It's when you plug it in and start using it that you notice a difference. The mouse pulls air into the sides and blows it out through a pattern of holes on the top, where your palm rests. While the AirFlo's internal fan doesn't move much air, the effect is apparent. A switch on the mouse's belly lets you adjust the fan speed or turn it off entirely.

To test the AirFlo, we arranged an intense gaming session in the Lab, to be attended by Greg Vederman, an editor at sister magazine *PC Gamer*, and by far the sweatiest person we know. After an action-packed hour of *Divine Divinity,* the Vede praised the AirFlo's dehumidifying powers. "Normally I'm a sweaty freak, but the AirFlo mouse keeps my hand nice and dry." We'll take his word for it.

In addition to its unique physical comforts, the AirFlo delivers speed and accuracy. Its 850dpi optical sensor is as good as any we've tested. It consistently tracks our position perfectly, no matter how quickly we move the mouse.

Although the AirFlo mouse has an ambidextrous design, it's restrictive to people who want more than two buttons and a mouse wheel. But we really don't expect more than the basics in a mouse this price.

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AirFlo Mouse

MAXIMUM PC VERDICT 9

STIRRED

Cool air on our fingers makes us happy.

SHAKEN

No side buttons doesn't cut it these days.

$40, www.nyko.com

Sniper Boomslang 2100

The more things change, the more they stay the same. It's the reincarnated Razor Boomslang 2100, complete with a poorly placed ball.

Many, many moons have passed since we last reviewed a mechanical mouse, and with good reason. Optical mice eliminate many of the pitfalls that plague ball mice, such as the frequent need to clean the rollers and imprecise tracking on uneven surfaces. The original Boomslang emerged at a time when optical mice weren't yet sensitive enough or fast enough for gaming, a time when gamers were clawing and scraping for any device that would give them a slight edge in shooters.

This new model is essentially identical to its sleek-looking predecessor. It has the same five-button ambidextrous design—the scroll wheel doubles as the center button—and the ball still resides in the same odd place, directly under the palm. Sensitivity is great, and the mouse's accuracy is pixel-perfect, as advertised. In fact, the Boomslang's movement felt even smoother than an optical mouse.

The problem is that using the Boomslang for extended periods of time is terribly uncomfortable. The mouse's flat design and oversized buttons feel awkward and ill-conceived. And the hyper-sensitive buttons are so twitchy that your fingers are likely to accidentally depress them at the slightest touch. Furthermore, there's the mouse ball's illogical location. Most mousers use their wrists and fingers to move the cursor on-screen from side to side and up and down, but because the Boomslang ball is positioned so low on the mouse, it takes full-on arm movement to get the cursor to budge!

We know there are an irrational handful of Boomslang enthusiasts out there who'll be thrilled with the product's return. To them, we say enjoy.

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Sniper Boomslang 2100

MAXIMUM PC VERDICT 6

BOW-WOW

High resolution and great precision are terrific in games.

MEOW

Goofy design makes us wonder if the engineers who designed it are trackball users.

$80, www.bfgtech.com

your PC. By now, you're probably tired of hearing about the freaky mechanics of every component. Well, you're in luck. Choosing a good mouse and keyboard for optimum gaming and ergonomics is pretty easy.

The keyboard part doesn't require any brainwork. Go to the store and fiddle with them all—standard keyboards, split keyboards, quiet ones, "clicky" models. Keep going until you find one that's comfortable. Even the slightest discomfort you feel is going to be magnified several times over with an hour or two of typing. Many keyboards also offer bells and whistles such as multimedia control, wireless transmitters, and the like. If you want those features, great. But only on those keyboards that pass the comfort test.

Now on to our little rodent friends. There are a few things every mouse should have. Three buttons are absolutely mandatory, as is a scroll-wheel, preferably positioned in the center of your mouse. More buttons are optional, but not required. Truth be told, we don't use them that often, even though they can be extremely handy for web designers and *Excel* wonks who can program the buttons to do all sorts of parlor tricks.

In addition to the aforementioned prerequisites, there are really just two other things to consider before purchasing a mouse: comfort and accuracy.

Comfort's self-explanatory. You want a mouse that's sized for your hand, has buttons within easy reach, and that can be used for extended periods without discomfort. If your fingers seize up after a marathon gaming session, you're going to have serious carpal tunnel problems down the road. If a demo unit is unavailable, don't hesitate to take your prospective mouse out of the package right there in the store. Fondle it. Skim it across the display shelf. Knock yourself out.

Gamers need an optical mouse that senses movement with a small beam of red light at the base. These can be far more accurate than the old-fashioned roller-ball mice, which have to be cleaned

Fingerworks Touchstream LP

Learning to use the Touchstream is like learning Braille. Doesn't that sound like fun?

The Touchstream is essentially a keyboard-size touchpad that takes the place of both your keyboard *and* mouse. To operate the device, you have to master a dizzying array of finger movement combinations—glides, touches, squeezes, and other coordinated motions. For example, tapping two fingers on the right side of the board results in a "mouse click," while touching two fingers on the left side of the keyboard is equivalent to tapping the arrow keys. Scrape four fingers up and down, and your page scrolls. Get the idea? The scheme is kind of neat at first, and works pretty much as advertised, but the Touchstream certainly isn't the most effective keyboard/mouse combo we've ever used. Far from it, actually.

During testing, we had no problem performing rudimentary mouse/keyboard maneuvers, such as dragging the cursor around, surfing the web, and highlighting text. However, the touch surface is extremely sensitive. This has the benefit of lowering the amount of effort required to activate keys (and fatigue, in the long run), but greatly increases the probability of accidental key touches. So, for example, if you merely rest your fingers on the keys, unwanted letters will appear in your document. Shift your fingers across the surface in a weird way, and windows will minimize, along with other unwanted anomalies.

The folks who sent us the Touchstream told us, "It takes a bit of practice," which is a huge understatement. It takes *a lot* of practice. In fact, a rep from Fingerworks told us it would take anywhere from one week to one month of practice to type comfortably on the device. Maybe we're addled by ADD, but we're not spending a week—much less a month—learning how to type again. It would take us all of a week just to write this review on the Touchstream, and that's a learning curve that's just too steep.

Its fold-in-half design makes it a decent travel keyboard, but we honestly found it too frustrating to use either as a keyboard or a mouse. The Touchstream also has problems with keyboard/video/mouse ports (KVMs), but considering its other issues, that's the least of its problems.

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MAXIMUM PC VERDICT 4

TOUCH-TYPING
Portable, very ergonomic

TOUCH FOOTBALL
Way too sensitive, learning curve is too steep.

$340, www.fingerworks.com

"TESTING A MOUSE OR KEYBOARD ISN'T AS EASY AS YOU MIGHT THINK, BECAUSE DIFFERENT PEOPLE HAVE DIFFERENT PREFERENCES."
—WILL SMITH, TECHNICAL EDITOR

periodically (another chore you don't need). But not all optical sensors are created equal. A slow optical sensor will turn your smooth-as-buttah mouse movements into stuttery cursor spasms. Not everyone measures mouse responsiveness the same way, but testing a mouse for gaming is easy. To test the rodent, firmly grab it, then move it from one side of your mousepad to the other as fast as you can. Watch the cursor as you do this. If it matches your movements across the screen, the mouse is golden. If it jumps madly across the desktop, ditch that mouse for another one.

Some of us are driven crazy by the constant tug-of-war with mice cords, so cordless mice can be a relief. But cordless-mice manufacturers have been slow to provide transmission rates sufficient for gaming. In fact, we think there's only one cordless mouse that comes close to performing well enough for gamers, and that's the

Logitech MX700 (reviewed later in this chapter). Most other mice sacrifice update frequency for longer battery life, and the result is piss-poor game performance.

How We Test Mice

Whereas most PC-related components, devices, and products can be objectively and scientifically tested with benchmarks and other measuring devices in our Lab, gauging the reliability, comfort, and overall quality of a mouse or keyboard is relatively subjective.

So how do we do it? By using it in real-life, real-world circumstances. When Mouse and Keyboards Specialist Will Smith receives a mouse for review, for example, he immediately replaces the mouse he's currently using at his desk with it. After using a mouse for two or three weeks to navigate in Windows and—perhaps more importantly—to play games, it rapidly becomes clear if the mouse is high or low quality.

As we use the mouse, we pay attention to whether or not it feels comfortable in our hand and how easy or hard it is to reach and depress the buttons. We also pay attention to how responsive those buttons feel when clicked. Additionally, when we're playing fast-paced 3D shooters or real-time strategy games—which require rapid and often extremely jerky mouse motions—we pay close attention to how the mouse responds to changes of speed and direction. Good mice—such as Logitech's MX 510—can, while others can't. In the case of wireless mice, we examine the latency or

MAXIMUM PC KICK ASS PRODUCT

Logitech MX-510

Available in both shiny blue and red colors, the 800dpi optical sensor on the MX510 makes it as deadly as it is attractive.

When it comes to mice, there are good optical mice and bad optical mice. Good mice are responsive, fast, and accurate—even under the most demanding deathmatch conditions. Bad mice—with inferior optical sensors—just can't keep up when the mouse is moving rapidly. Symptoms of an inferior optical sensor include stuttery movement, poor response, and loss of directional control. The Logitech MX510 definitely fits into the "good mice" category.

The MX510 is an updated version of a *Maximum PC* favorite, the MX500. In addition to the shiny metallic shell, which comes in either blue or red, the MX510 adds a slightly improved optical sensor. Neither Logitech nor Microsoft will confirm this, but our hunch is that the MX510 sports the exact same high-quality optical sensor that powers the kick-ass Intellimouse Explorer 4.0. It's difficult to say with certainty, but in our tests the MX510 is every bit as imperturbable as the latest Intellimouse.

The MX510's 800dpi sensor claims an update rate of 5.8 megapixels per second, which lets the sensor move up to 40 inches per second with no skips, blips, or whirs. In testing, we simply could not make the MX510 skip, no matter how quickly we moved it. And the mouse's sensitivity scales well, from detecting minute movements while sniping to lightning-quick evasive maneuvers. With its two main buttons, a clickable scroll wheel, and a pair of thumb buttons, the MX510 is outfitted for even the most demanding mouser.

We do miss the tilting scroll wheel that Microsoft's latest Intellimouse features. While we initially pooh-poohed the idea of a side-to-side scroll wheel, we became hooked on it after a few months and now can't imagine mousing without it. Still, the omission of the side-scroll functionality isn't enough to deny this otherwise ideal mouse a Kick Ass award, but it is enough to knock it down from a perfect 10.

Left-handed mousers, beware: Although the MX510 looks like it would be comfortable for lefties, it's not. It's designed exclusively for right-handed mousers. If you use your left hand to mouse, you'll probably be better served by the ambidextrous Logitech MX310, which houses the same exact sensor.

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MAXIMUM PC VERDICT 9

CHEESE

Pixel-perfect accuracy and lightning-quick response in a comfortable package.

D-CON

No side-to-side scroll wheel makes us sad.

$50, www.logitech.com

lag time between our movement and/or button press and the desired onscreen result. For gaming, this is particularly important. Finally, we evaluate any extra features, such as extra buttons or increased functionality (such as force feedback or the aforementioned tilting scroll wheel).

In our mind, the perfect mouse will be wireless, boast lightning-fast response times, have easy-to-reach buttons, and feel comfortable enough to use for hours.

How We Test Keyboards

We test keyboards along similar real-world lines. If a *Maximum PC* Lab staffer is testing a keyboard, they're expected to use that keyboard full-time at their desk. Because ergonomic efficiency is paramount with keyboard design, we pay extra attention to the way the keyboard feels. This ranges from how the individual keys feel when pressed to how gratifying a "click" the keys make when depressed. We prefer that our keyboards not click too loudly, but we expect them to feel nice and solid when we're typing. (See what we mean about subjective?)

Additionally, we also rate the keyboard's extra features, such as extra buttons and added functionality. As you can see as you read the reviews in this chapter, keyboards that force us to press the F-Lock key to access normal F-key functions lose points.

MAXIMUM PC KICK ASS PRODUCT

Nomus 3G

Ergonomically minded, the Sun-Flex Nomus was designed to eliminate repetitive stress-related injuries. Aye, at least she had good intentions.

You can imagine our surprise and skepticism when we first unpacked the Sun-Flex Nomus, which is an alternative mouse. Its footprint alone elicited gasps of horror. Where are we supposed to put *that*? we wondered, looking askance at our cluttered work areas. But, you know, after spending just a short time with the sizable bugger, we began to appreciate its unique qualities.

Like many a Scandinavian company these days, the Swedish firm Sun-Flex concerns itself with ergonomics, and the Nomus embodies that mindset. It was designed to eliminate the physical discomfort that's often associated with repetitive and prolonged use of a mouse or trackball. For one thing, the buttons, cursor control, and scroll function sit at the front and center of your workspace, allowing easy ambidextrous operation, so no one hand bears the brunt of your computer usage. Furthermore, all that material surrounding the buttons makes for 24/7 wrist support, so to speak. And to put things in perspective: While the Nomus may take up unprecedented space in front of your keyboard, you in turn gain all the space that was previously reserved for mouse maneuvering.

Getting accustomed to the Nomus was surprisingly easy, and a huge relief since it shipped with absolutely no instructions. A visit to the web site (www.sun-flex.com) clued us into the theoretical benefits of the product, and the design itself borrows enough from traditional mice to make adoption of the unit fairly intuitive. There's a set of right- and left-click buttons for either hand; a single button for "scrolling" (which in fact functions with a straightforward click rather than a turning motion); and a rubbery bar in proximity to your thumbs that rolls forward and back and slides side to side for cursor control. As you might predict, the Nomus is not ideal for gaming.

All in all, using the Nomus with a standard keyboard for non-gaming chores was not only comfortable, but kind of fun. However, using the Nomus with an *ergonomic* keyboard is awkward and impractical—an irony we can neither ignore nor reward.

Originally published June 2003

MAXIMUM PC VERDICT **6**

SWEDISH FISH
Easy to use and good for you

LUTEFISK
Incompatible with ergo keyboards, unsuitable for gaming

$180, www.sun-flex.com

Looking Ahead: Mice & Keyboards

The future promises more of the same: comfortable, high-quality input devices.

It would be easy to think that mice and keyboards are so highly evolved that they won't improve significantly over the coming years. However, if there's one thing we know about PC components, it's that they're like life. Change is constant—products rapidly sprout new appendages for all kinds of useful new features and functions. If you compare the mouse and/or keyboard of three years ago to today, you'll notice a huge difference.

There are three key aspects to mice and keyboards: features, performance, and comfort. We expect to see leaps forward in each of these categories over the next two years. Beyond that, who knows? The mouse of 2010 will likely be dramatically enhanced.

Here are the big trends and product developments we see coming in the next few years.

Wireless domination: No big surprise here. We expect that in a few years, most of our input devices are going to be wireless. The real question is whether or not Bluetooth will slowly take over as the wireless protocol of choice. It's certainly more versatile, but time will tell. Were we betting geeks, we'd say Bluetooth will eventually be the PC wireless connectivity protocol of the future.

In the future, we expect keyboards to become increasingly specialized, like this one, which was built with video editing in mind.

More ergonomic keyboards: With worker productivity at unprecedented heights in terms of hours per worker, we expect to see a rash of repetitive stress-related injuries. To counter this—or maybe just to prolong disaster—we expect to see the major keyboard manufacturers make even more dramatic alterations to their designs. As an example, we feel it's only a matter of time before we see a steeper keyboard design; increased elevation of the wrists is healthier.

More functional keyboards: We fully expect to see the F-Lock problem corrected in 2005. However, we also expect to see even more increased functionality with these devices. Our wish list starts with the re-integration of two-port USB hubs. We also expect to see more useful—and more configurable—

> ***ONE MORE FORWARD-THINKING FEATURE WE EXPECT TO SEE SOMEDAY ON KEYBOARDS IS THE DISPLAY.***

buttons on the keyboard. One feature we're puzzled we haven't seen more of in keyboard design is a notebook-style touchpad or thumb controller. And one more forward-thinking feature we expect to see someday on keyboards is the display. It sounds crazy, but think about it—displays are everywhere these days. Again, time will tell.

More precise mice: This one's also a no-brainer. Only a few years old, the optical sensors on even the low-end mice will make dramatic improvements over the next 18 months. Along similar lines, high-end mice will be more precise than ever.

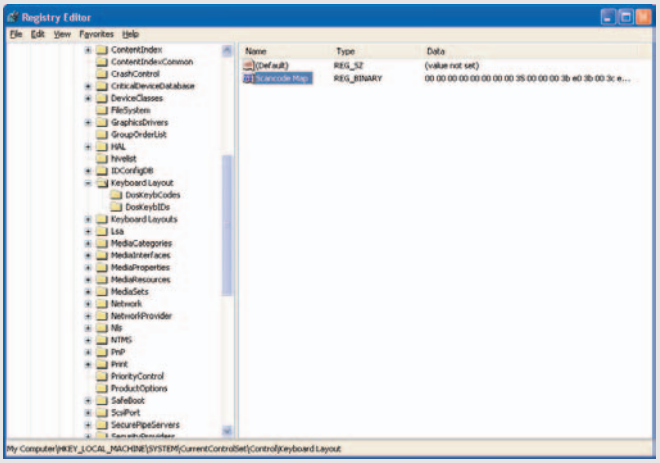
More functional mice: Similar to keyboards, we expect to see higher-end mice incorporate more features into their design. The tilting scroll wheel is likely just the beginning. As a corollary to this thought, we also expect to see the Windows operating system allow such features to be more useful and flexible within the interface.

More comfortable mice: While more expensive to make, we expect to see heavier, more comfortable mice as the years progress. One other development we think is going to become more popular over the coming years, given the increased focus on ergonomics and comfort: trackballs. Useful and more precise, trackballs allow people who suffer from painful RSI problems an alternative.

Specialty mice: Different people use their mice for different tasks, so it's only a matter of time before we begin to see more specialized mice. And we're not just talking about gaming.

How to Work Around the F-Lock Key on Your New Keyboard

Microsoft's new keyboards—the Internet, Multimedia, Natural, and Natural Multimedia keyboards—are all top-notch and come highly recommended by the *Maximum PC* Lab. All versions offer excellent tactile feedback and lots of extra features via a top row of buttons that, depending on the keyboard version, can navigate the web and quickly call up Windows Media Player, volume controls, and even the calculator. Unfortunately, these keyboards have one major problem. In an effort to increase Windows functionality, the F-keys have been "enhanced"—pressing them allows you to cut, copy, paste, and other actions. The problem is that normal F-key functions are disabled unless you turn on the F-Lock key.



Baffled or frustrated by the way your fancy new keyboard locks you out of default F-key functions? We have a workaround for you.

Copied by keyboard manufacturers such as Logitech and BenQ, this functionality is, simply put, the bane of any hardware tweaker's or gamer's existence. It works just like Caps Lock and Num Lock, except for one minor problem: F-Lock is turned off by default, and there's no way to change that. So when you need to get into the BIOS on your fast-booting PC, you have to scramble to press the F-Lock key, and then manage to press F1 in the second that it takes any modern BIOS to boot.

Luckily there are fixes for both Logitech and Microsoft keyboards available on the web. A Registry hack for Microsoft keyboards can be downloaded at www.mvps.org/jtsang/flock.html and the Logitech keyboard fix is at www.ben.pope.name/logitech.html.

Thankfully, companies like BenQ have started to correct this flaw by turning F-Lock on by default. We expect that next year's keyboards will all work this way.

Chapter Fourteen

Wi-Fi

Networks, Routers, Streaming Media, Oh My!

In our March 2004 issue, we bought and constructed a dollhouse—a very masculine dollhouse—to illustrate the proper placement and configuration for our readers' Wi-Fi networks.

Make any printer a wireless network printer
Using a handy $150 wireless print server, you can transform any USB printer into a network printer. In other words, you can print from any PC in your home and hide the printer in an out of the way location. The model pictured here is the SMC 2621W-U, which uses the 802.11b protocol. Alternatively, you can hang your printer off your central PC.
Position your access point carefully
We mounted our access point on the central wall of the house. By mounting it vertically, we send most of the signal into the areas where we most need it—the downstairs bedroom, our office, and the living room on the other side of the wall.
Watch out for wireless obstructions
Beware of walls that are made of cinder blocks, have steel studs, or contain a lot of pipes. These materials absorb and reflect radio waves, and will interfere with your signal.
Avoid naughty appliances
In addition to potential pitfalls built into the structure of your home, some appliances can also cause problems. Beware of refrigerators and microwave ovens in particular.
Browse the net from anywhere in your house
This is the number one reason most people buy into wireless. Whether you're sitting on your couch or lounging in bed, you can still connect to the Internet. It's so handy, it's hard to imagine a time when there wasn't a laptop in the living room.
Shut out Wi-Fi banditos
Protect your wireless network from would-be Wi-Fi thieves by enabling WEP and preventing unknown wireless cards from connecting to your network. By using the Cantenna Wi-Fi booster (www.cantenna.com, $20), broadband thieves can pick up wireless signals from several hundred feet away. Don't be a victim.
Connect everything in your living room
Without wireless, connecting a game console to the Internet is an exercise in frustration, and an OSHA-level work hazard. With a wireless bridge and the appropriate wireless gear, you can connect your consoles and even stream music, photos, and video from your main PC—all without wires.

Perhaps more than anything else—AMD's introduction of 64-bit computing, the season of monster-sized hard drives, the breakthrough quality levels of flat-panel LCDs—the last year has been dominated by wireless networking. Smashing new CPU releases and future technologies have dominated the headlines of hardcore PC tech and computing magazines, but all the while, mainstream America has finally been able to untether itself from at least one set of wires and eagerly migrate to a far more convenient flavor of home networking.

Using wireless devices like Creative's Wireless Music (pictured above) or Slim Devices' Squeezebox (reviewed on page 184), you can keep your MP3s on your primary PC, and access them from your living room.

This came as no surprise to us. Always ahead of the curve, we, like numerous PC enthusiasts, had flocked to broadband Internet access in 2001, and had networked our homes later that year. This early adoption in turn helped the Wi-Fi networking manufacturers to work out some of the kinks and inefficiencies in this new technology.

By the middle of 2003, millions of people had broadband access and wanted to share their Internet connection with family members and friends. For others, the luxury of surfing the web from the comforts of their homes proved too attractive to resist. This desire combined with the dramatically increased accessibility of Wi-Fi equipment, both technically and financially, made it easy for casual PC users to jump into home networking.

In a matter of half a year, coffee shops, stores, laundromats, and even McDonalds all began to offer Wi-Fi Internet access. The year 2004 will be marked as the year the wireless revolution began in earnest.

This isn't to say that wireless networking is flawless; to the contrary, this nascent technology can be a pain in the rear end to install and configure. However, as millions of PC enthusiasts will tell you, the trouble is easily worth the potential pains. Once you taste the freedoms of Wi-Fi, it's hard to go back to wired life.

Okay, enough chit-chat. Let's take a look at some of the major product trends and technologies of the last year.

802.11g Opens the Pipe

On June 12, 2003, the Standards Board of the Institute of Electrical and Electronics Engineers (IEEE) ratified an amendment to the 802.11 Wi-Fi standard. Dubbed 802.11g, this new spec raised the data rate of IEEE 802.11b networks from 11Mbps (megabits per second) to a whopping 54Mbps.

Realistically, this increased data transfer rate didn't mean much in the way of faster Internet access for Wi-Fi networks. To take advantage of the faster data rates, you have to be transferring files via your wireless devices; consumers pulling down web pages and files from the Internet would notice no difference. And even when transferring files across an 802.11 wireless network, consumers would never actually see data rates anywhere close to 54Mbps; more than half of the bandwidth in a typical wireless network is consumed by data checking and correction.

Regardless, a slew of new 802.11g devices hit the market. Hardcore PC enthusiasts flocked to the new standard, upgrading their wireless networks in pursuit of even faster data transfer rates. Second, Wi-Fi manufacturers offered huge price cuts on 802.11g gear, making it much more affordable and therefore accessible to mainstream PC users. Always hip to a trend, PC makers jumped into the wireless waters big-time. *Maximum PC* soon found itself inundated with all sorts of Wi-Fi products. Here's a quick breakdown of all the major categories.

> ***"THE YEAR 2004 WILL BE MARKED AS THE YEAR THE WIRELESS REVOLUTION BEGAN IN EARNEST."***

D-Link AirPlus XtremeG

Aye, she's not the prettiest 802.11g router at the prom, but she's definitely the fastest!

On the surface, the XtremeG includes all the features we covet in a wireless router: full 128-bit WEP security, support for the new WPA security standard, a rudimentary firewall, NAT support, and a myriad of other security options, including a stealth mode that can hide its very existence from Internet evil-doers. The XtremeG also sports four wired Ethernet ports for all your tethered machines.

Installation for the XtremeG is easy, even for novices. The documentation covers setup options for nearly every network configuration we could imagine. We configured the router by connecting it to a PC with a simple Ethernet cable. Once the router doled out an IP address to our wired PC, we were able to use the web-based configurator's easy setup wizard to tune the router's settings. While the wizard didn't go so far as to suggest that we change the default SSID (cleverly, it's "default," which is kind of like a "1234" password), it did give us the option to adjust the SSID, WEP, or WPA settings.

The XtremeG includes a bonus feature that uses two channels to double the available bandwidth for wireless clients connecting to the router. We measured fantastic download speeds using the 108Mbit/s mode, and the XtremeG was able to download our 533MB test file in 3 minutes, 18 seconds; more than twice as fast as the standard 802.11g mode. Oddly, uploads were only slightly faster using the enhanced mode.

We have only one minor complaint about the XtremeG. In the version we tested, there is no immediately obvious way to disable its router functionality so that it can simply serve as a standard access point. You can get AP functionality by disabling DHCP and connecting one of the hub ports (instead of the WAN port) directly to your LAN, but this isn't well-documented. Granted, most people who purchase a Wi-Fi router will want to use it as a router, but home network topologies occasionally change, and there's no reason a wireless router shouldn't be able to serve as an access point as well.

Originally published January 2004

D-Link AirPlus XtremeG

MAXIMUM PC VERDICT 9

CHECKING OUT

Lightning-fast file transfers are capable with this outstanding 802.11g router.

CHECKING IN

Understandably, the fastest 108Mb/s mode works only with other D-Link products.

$110, www.dlink.com

Wi-Fi Product Categories

Access points: Also known as routers, these devices allow you to share your Internet connection with a number of wired and wireless clients. The cable or DSL modem plugs directly into the access point, which assigns local IP addresses via the Dynamic Host Configuration Protocol (DHCP) to any computer that is plugged into it or initiates a wireless connection. Standard access points allow for 4 wired connections; the number of wireless clients allowed can often go up to 25 or 50! Interestingly, in early 2004, we began to see access points boasting advanced data transfer acceleration. Produced by Linksys and D-Link, among other companies, these next-gen 802.11g routers used two methods to speed up or maximize data rates. One method was to utilize proprietary acceleration schemes that required consumers to use the same company's products across their wireless network. The other technique we saw was a reduction of the maintenance overhead of data checking and correction.

PC cards: Two years ago, built-in wireless networking was rare to find in PC notebooks. Back then, if you wanted to gain access to a wireless network, you needed to purchase a Wi-Fi PC card that would plug into the PC card slot on your portable computer. Over the last year, the PC card went the way of the Dodo as more and more laptop manufacturers shipped their systems with built-in wireless networking devices. Thank goodness! These days, we've found USB-based wireless Ethernet adapters to be far more prevalent and popular. You can plug them into your desktop PC, Media Center, or even your TiVo.

Print servers: In our first generation wireless networks, we connected our printers to a computer on the network, which meant that, in addition to requiring the power to be on 24/7, the printer also had to be located right next to the host PC. Over the last year, however, we, like numerous *Maximum PC* readers, found ourselves unchaining our printers from our PCs by using wireless print servers. What's interesting is that the wireless print server had been around for a year or so already; it just took us a while to become sophisticated enough to realize its benefits.

Music and media servers: We found ourselves pleasantly surprised by the number of wireless devices released in 2003–2004 that were devoted to streaming music, pictures, and even TV shows across a network. How humane! Impressively, many of these media streaming boxes were small in size and extremely effective in taking advantage of Wi-Fi transmission rates to stream MP3s (which, even at their lowest compression rates, still only move data at a tiny rate of 192 kilobits per second) and JPEGs flawlessly from a host PC. Streaming video is still less than perfect, however; decoding these files on the fly currently requires more bandwidth than even 802.11g networks can handle. Maybe someday…

TiVo and PC Media Centers: In the middle of 2003, TiVo—by now a household name in the personal video recording space—released its Home Networking Edition. This special extension to TiVo's time-shifting capabilities was developed with wireless home networks in mind. Series 2 units sported an Ethernet jack on the back that you could plug directly into a router. Thinking smartly, TiVo included a USB port that you could plug a wireless Ethernet card into as well. Once you paid the $149 fee and got this Home Networking extension running, you could play MP3s and view pictures from any PC on your wireless network.

Microsoft Base Station MN-700

The Microsoft 802.11g offering is great looking, and easy…to configure, that is.

The MN-700 has many of the same basic features as the XtremeG, but doesn't stray as far from the G spec as D-Link's router does. What really sets the Microsoft router apart is the astoundingly simple configuration routine.

Unlike some other "easy" configuration routines, which leave your network as vulnerable as Ashton Kutcher's career, Microsoft's setup suggests you change the SSID and enable WEP or WPA security. The router then asks you several simple questions that allow it to mesh properly with your home network. Based on the answers you give, the router automatically configures itself as either a router that shares a single IP with every computer on your network, or as an access point that serves only as an interface between the wired and wireless network. It will even configure persnickety PPPoE settings for pesky DSL providers who require them.

Unfortunately, the MN-700's performance disappointed us somewhat. In the compatibility mode, it frequently slowed to 802.11b speeds when 802.11b devices were around, bringing all the PCs on our wireless LAN down to 11Mbit/s throughput. Once we set the router to 802.11g-only mode, performance improved significantly, but the Microsoft router still couldn't compete with the D-Link's default performance. We definitely wouldn't recommend this router to someone who needs high-speed 802.11g performance in a mixed environment.

The MN-700's sub-par performance can be easily forgiven because of its easy-to-use configuration interface. We'd even recommend it to relatives who have a penchant for making 2 a.m. tech support calls to us.

As always, if you frequently find yourself waiting on file transfers across your wireless LAN, or if you'd like to stream music or video across a wireless connection, now is the time to buy 802.11g wireless products. Gone are the days of incomplete standards and half-assed Wi-Fi implementations.

Originally published January 2004

Microsoft MN-700

MAXIMUM PC VERDICT 8

PERSONAL DIGITAL ASSISTANTS

So simple to configure, even your grandmother can do it. Seriously.

PUBLIC DISPLAYS OF AFFECTION

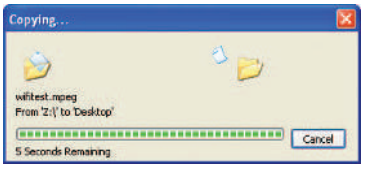
Poor operation in mixed mode means that this router works best in 802.11g-only environments.

$100, www.microsoft.com

How We Test: Wireless Routers

TESTING WI-FI IS A FAIRLY STRAIGHTFORWARD TASK; AT LEAST UNTIL YOU HAVE TO JUDGE EASE OF INSTALLATION.

Want to test wireless router performance the *Maximum PC* way? Analyzing wireless networking hardware isn't as straightforward as running videocard or CPU benchmarks, but we devised a suite of tests that produce real-world, repeatable results. Here's how it's done:



Testing routers in the Maximum PC Lab is a fairly straightforward process.

- First, set up a private network that's disconnected from the Internet and any other network. Connect one PC to the router using standard 100baseT Ethernet, but connect the other via the wireless network. We enable 128-bit WEP to more closely emulate real-world conditions.
- Second, transfer a compressed MPEG-2 video file that's larger than 300MB from a Windows shared folder on the wired machine to the wireless machine, and measure how long it takes to transfer.
- Once that's done, transfer the file back to the wired machine's shared folder and measure the amount of time that takes.
- After performing these tests, we connect the router to the Internet and check to see if it has features such as VPN support, a firewall, port forwarding, and a virtual DMZ. A good router will have all this and more—if these features are present, we turn them on to see how they work.
- We calculate the final verdict by also factoring in performance and other features. Critical to the review rating success of any Wi-Fi product: how easy it is to install and configure.

Wi-Fi snooping gear: Not quite as big a category as the previous five, a number of devices built for snooping, scoping out, and hacking other peoples' wireless networks came through our office last year. This made one thing abundantly clear to us: The public is doing a poor job of protecting their wireless networks.

Security Is a Major Concern

Okay, chances are that you are not in possession of classified or top secret government documents. If you are, you have other problems than the ones we're about to get into. But still, doesn't the thought of someone intruding on your network and looking at all the files, documents, pictures, and music you've accumulated creep you out? It creeps us out, which is why we went out of our way over the course of the last year to recommend techniques, tips, and software that would help our readers protect themselves.

The bad news is that there's no way to completely protect a wireless network from intruders; it's just not possible. Your access point constantly broadcasts its signal wirelessly, and anyone in range with enough time and expertise will be able to break whatever security you put into place. In a best case scenario, they'll leech bandwidth from you.

The good news is that it takes a lot of effort and some specialized hardware and software to break into a wireless LAN. In a perfect laboratory environment, it takes a day or more to collect enough data to crack one WEP key. In a real-world situation, it can take several months. Luckily, between Windows XP and today's access points, you have all the tools you need to keep all but the most determined crackers out.

WEP, short for Wired Equivalent Privacy, is a protocol designed to adhere to the same level of security

How to Secure Your Wireless Network

MAXIMUM PC PRESENTS FOUR EASY WAYS TO PROTECT YOUR DATA FROM INTRUDERS.

The first action you should take is to enable WEP or WPA on your access point. WEP and WPA encrypt every single transmission over your wireless network, from harmless requests for a dynamic IP address to the contents of the files you download over Kazaa. At the bare minimum, you should enable a 128-bit WEP key for your wireless network. Don't keep telling yourself you're going to do it. Do it today!

Enabling WEP isn't enough to protect your network, though. You need to make sure the WEP key is sufficiently random. To create a truly random WEP key, you can do one of several things. You can mash random letters and numbers on the keyboard until you've created a 26-digit key. You can roll three dice and use the value of the dice to determine each digit of your key. Or you can use a simple random number generator—several are available at www.download.com.

Make your wireless clients inaccessible to the rest of the Internet

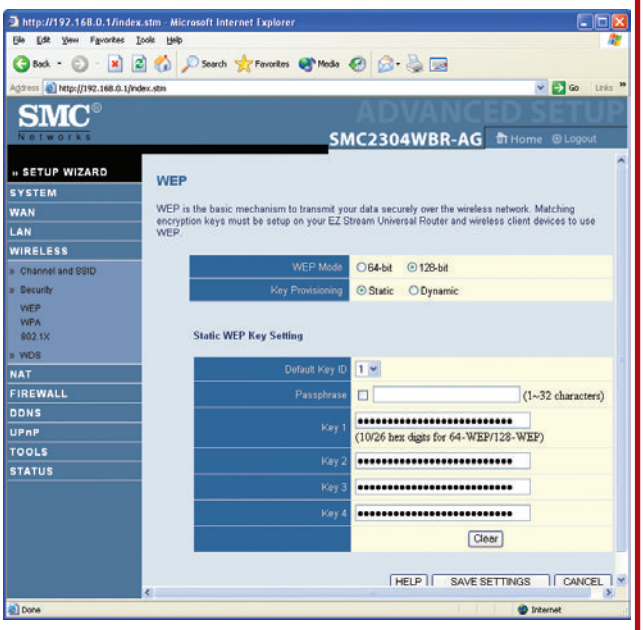
One of the main ways that evildoers crack Wi-Fi encryption keys is by sending massive amounts of data across the wireless network, then using that traffic to suss out the WEP key for the network. However, if they can't connect to your wireless computers from the Internet, all they can do is sniff normal day-to-day traffic. Make sure your wireless PCs have private IP addresses that are inaccessible to the rest of the net. Private IPs usually start with 192.168 or 10.15.

Prevent unauthorized computers from connecting

Every network card has a unique identifier built in. This number is called the MAC address. Most access points allow you to limit connections to computers with known MAC addresses. If you manually input the MAC address for each of the computers you intend to connect to your wireless network, it will be much more difficult for someone to infiltrate your network.

Change your WEP or WPA key regularly

It's a pain, but take the time to change your WEP or WPA key once or twice a month. By occasionally changing the encryption key, you can prevent anyone from collecting enough data to gradually reverse engineer any one of your keys.



It's likely that you won't ever experience a security breach of your wireless network. But imagine someone breaking in and destroying all your files, music, and pictures. Makes you want to protect yourself, right?
Enable WEP or WPA

D-Link Air 660W CompactFlash Wireless Adapter

Get your Pocket PC online with D-Link's wireless adapter.

Running a Pocket PC with a wireless network card is as refreshing as a cool breeze to a kilt-clad Scottish highlander—or so we would imagine. The D-Link 660W Wireless Adapter not only liberates you from the confines of cables and cords, its rock-solid reliability allows you to wander about freely without worrying about your connection. After the CompactFlash card is installed and configured (make sure you're using the latest version of *ActiveSync*), you simply access your specific AP or ad-hoc network, and you're solidly connected. The 660W was consistently able to achieve signal strengths and qualities that measured between 90 and 100 percent in the Windows Control Panel, even in instances when a Dell Inspiron 8200 internal Wi-Fi NIC mustered just a 20 to 30 percent readout. This is an admirable feat for the smaller, lower-powered D-Link device.

However, once its connection began depreciating, it was essentially useless.

While the card itself is everything you'd need for Pocket PC Wi-Fi, the software makes it truly stand out. The latest version of the drivers (get it!) allows you to create connection profiles for each distinct connection, so you can move from one access point to another by selecting the appropriate profile, instead of reconfiguring each connection anew. The bundled *SiteSurvey* is also cool. A bar graph represents each wireless channel and measures its signal strength to make scanning for a connection exceedingly easy.

Originally published August 2003

MAXIMUM PC VERDICT 9

HIGHLANDER
Reliable, great signal strength and quality

JUST PLAIN HIGH
Essentially useless once connection depreciates

$100, www.dlink.com

Wi-Fi Installation Tips

FOLLOW OUR ADVICE, AND YOU'LL EXPERIENCE PURE WIRELESS BLISS AROUND YOUR NEXT INSTALLATION.

Nine times out of ten, setting up a wireless network is so simple, a baby could do it. However, the one time that problems arise, they're usually more complex than a William Gibson novel. The vast majority of problems can be avoided altogether… if you follow a few simple tips when you set up your network.

Proper placement is a virtue

Whether you purchase a full-fledged router and plan to use it to share your Internet connection with all the PCs in your home, or simply connect a wireless access point to your existing wired network, the most important thing you need to consider is the placement of the wireless AP in your home. When situating your access point, it's important to understand that the coverage area won't be a perfect sphere. Instead it will be flattened, with the access point in the center. Ideally you should place your AP near the center of your home, on the same floor where you want the best coverage.

In addition to the physical location of your access point, beware of typical signal-killing pitfalls. Anything dense can impede reception. In most homes, this means concrete and metal walls, but we've even seen densely packed bookshelves ding Wi-Fi performance. Many appliances, such as refrigerators, ovens, microwaves, or anything with an electric heating element or compressor, create strong electric fields that adversely affect your signal quality.

Once your AP is installed and configured according to the manufacturer's directions, test the reception in different areas of your home. Take a Wi-Fi equipped laptop to each room you want to connect from, and check the signal meter. Green and even yellow signals are acceptable, but any signal in the red will work inconsistently, which will quickly become annoying.

Eliminate the low-signal-strength blues

You have several options if you've caught the low-signal-strength blues. The easiest and cheapest trick is to relocate or reorient the access point. Leave your test laptop in the trouble spot, then move your AP a few feet and recheck the signal strength in the trouble spot and the rest of the house. (Make sure you check your other points before you make the new location permanent.)

If you've tried several different rooms and have avoided every possible potential trouble spot, you may need to purchase some additional hardware. We recommend purchasing a repeater, which will add an extra coverage bubble to your LAN's range. They usually work with any brand of access point, and can be placed anywhere within your existing coverage area. We've had better luck for about the same price using repeaters instead of signal boosters.

In addition to access points, routers, repeaters, and signal boosters, Wi-Fi bridges are useful for connecting wired Ethernet devices to your wireless network. Most bridges available today are used to make game consoles and other consumer electronics devices that require network connections to be wireless.

as that of a wired LAN, which is protected by the physicality of the network. In other words, you need to be physically connected to a LAN by a cable in this network architecture. Wireless LANs, also known as WLANs, don't have this luxury. WEP provides security by encrypting data as it is transmitted over radio waves. WEP is router-based; when you configure your wireless access point, you turn WEP on, specify a 64-bit or 128-bit password, and then set up the password via Windows XP's wireless network manager. Unfortunately, WEP is not as secure as it could be. Still though, it's better than nothing, and will deter most casual snoopers.

In late March 2003, Microsoft released the Wi-Fi Protected Access standard. Known as WPA, this new network security solution is intended to replace WEP by offering more robust methods of data encryption and network authentication. WPA makes it harder for crackers to break into your network by encrypting each bit of data with a unique encryption key; it also introduced a new integrity check on data being transferred so that an attacker couldn't modify packets of information being communicated. WPA is now built into the Windows XP operating system.

"WIRELESS IS EVERYWHERE NOW. YOU CAN'T CALL YOURSELF A HARDCORE PC ENTHUSIAST IF YOU DON'T HAVE A WI-FI NETWORK."
—WILL SMITH, TECHNICAL EDITOR

Creative Labs Wireless Music

The Creative Labs package includes two components: a Wi-Fi base station and an impressive remote control. Instead of putting a small, difficult to read LCD on the base station, Creative innovatively incorporates the LCD, used for browsing and selecting songs, with the remote control.

The Wireless Music's remote sports an LCD screen, which prevents you from squinting at a tiny screen on a far away base station when you want to find music.

Configuration is relatively simple. You install the Creative Labs software on the PC that houses your digital music, plug the streaming box into that PC's USB port, and input your wireless network's settings. After that, you disconnect the wireless box from your PC and connect it to your stereo, using either an analog or Toslink optical digital connection.

The Wireless Music device uses Creative's *MediaSource* jukebox software to itemize all your digital music, and a system tray applet to share music with up to four receiver boxes. Unfortunately, this server applet has some problems. First, the applet consumes at least 20MB of your PC's RAM, which is much more than any streaming applet we've seen (most use between 1MB and 5MB of RAM). The applet also runs only in the system tray, and not in the background as a Windows service. So if you want a dedicated media server that can stream music at any time, you'll have to perpetually leave an account logged in to Windows.

Sound quality is fantastic with both the analog and digital outputs. Unfortunately, the playback wasn't flawless, even with high-quality MP3s. Sometimes when you change tracks, the next song briefly starts, then hiccups, then continues. This is highly annoying, and is almost unforgivable in a $200 product.

The screen on the remote makes navigating even huge music collections a snap. We mowed through our 28,000 track test library using an interface similar to that found in Creative's MP3 jukeboxes. You can sort tracks by artist, album, or genre. Sadly, the streaming box suffers the same limitations as Creative's software. It occasionally fails to detect ID3 tags for songs ripped using other programs. Without the information in the ID3 tags, it's impossible to determine whether a tune is by the White Stripes or Mariah Carey without listening to it. That's just not cool.

Originally published March 2004

Creative Wireless Music

MAXIMUM PC VERDICT 7

+ 192 KBPS
The remote's screen makes couch browsing easy, even with large music collections.

– 48 KBPS
The hiccups on startup is unacceptable, and the server program should be a background service.

$250, www.creativelabs.com

Slim Devices Squeezebox

The Squeezebox is the best digital music streaming box we've ever tested. Its easy-to-read interface lets us tune surf from the couch, which makes us giddy.

At first glance, you might be unimpressed by the plain vanilla remote control and small black box sporting a two-line LCD display. But despite its humble appearance, the Squeezebox is the perfect digital streaming box for music enthusiasts.

Installation took us five minutes. You install the open source server software—called *Slimserver*—on the PC housing your MP3 collection. We used the Windows version, but OS X and Linux versions are also available. Via an easily readable display, you can effortlessly configure the Squeezebox for either a wired Ethernet network or a Wi-Fi wireless connection. During installation, you also have the option of installing the server software as a Windows service, which means it'll run anytime the machine is on, whether or not an account is logged in. Excellent.

The Squeezebox has analog RCA, coaxial SPDIF, and a Toslink optical SPDIF output. Sound quality is exemplary, especially when using one of the digital outputs. Every aspect of the Squeezebox's interface is configurable in the *Slimserver* software, from the size of the display to the way tracks and titles are listed. It's fast and easy to browse even enormous music collections using the search functions.

Searching by artist, album, or track is as easy as keying in the first few letters of the name and pressing enter. The Squeezebox will list all the choices that match up with your search. In addition to the search function, you can also browse by genre, artist, album, or track title. The *Slimserver* software even parsed the MP3 tags that the Creative software ignored—a definite plus.

Because *Slimserver* is an open source application, there are dozens of useful user-created plugins. With the right plugins, your Squeezebox can even display the local weather forecast, news updates, and serve as a smart alarm clock. Using the LAME encoder, you can stream anything to your Squeezebox that you can listen to on your PC, from Internet radio to songs from Rhapsody.

Originally published March 2004

Slim Devices Squeezebox

MAXIMUM PC VERDICT 10

MILHOUSE VAN HOUTEN

The excellent interface and server software make this a must-have for any audiophile.

RICHARD MILHOUS NIXON

Three hundred bucks is a tad expensive, but the Squeezebox is worth every extra penny.

$300, www.slimdevices.com

Hey, What Happened to Bluetooth?

Not to be left out, the *other* wireless networking protocol also made major inroads over the course of the last year. And while Bluetooth, the personal wireless standard, didn't penetrate consumers' homes and lifestyles as greatly as Wi-Fi, the technology nonetheless defied many PC enthusiasts' expectations by staying alive.

The problem, in many critics' minds—a few *Maximum PC* editors included—was that, with Wi-Fi becoming so popular, why would Bluetooth be necessary at all? Numerous devices—headsets, cell phones, and even printers—answered the question: it allows for an instantaneous data connection that made life easier. As an example, *Maximum PC* Tech Editor Will Smith has a BlueTooth enabled cell phone; because his laptop is also BlueTooth enabled, he can connect to the Internet with his laptop via his cell phone without having to physically connect the two. Additionally, he can use a hands-free headset with his cell phone without cables.

Then there was the seamy side of Bluetooth. At the beginning of the summer of 2004, we began to hear reports of a new phenomenon known as "toothing." Apparently, by using Bluetooth devices, people can cruise for anonymous sex partners by broadcasting messages to anyone within range. Human beings' ability to use technology to seek sex constantly amazes us.

Seven Unbelievably Cool Wi-Fi Tricks

WIRELESS NETWORKS AREN'T JUST FOR BROWSING THE INTERNET IN YOUR LIVING ROOM ANYMORE.

1. **Stream music to any room in your home**: With a streaming audio device, you can convert any old stereo into a jukebox storing every single CD you own. By housing your MP3s on one machine and streaming them to every other room in your house wirelessly, you'll be able to stop worrying about managing your music, and just enjoy it.
2. **Get rid of the Ethernet cable from your Xbox to your cable modem**: Whether you're into the Xbox, PS2, or Gamecube, you can play countless console games online. With a wireless bridge, you can connect any number of wired Ethernet devices to your wireless LAN.
3. **Set up a network of Wi-Fi webcams**: Ever wonder what your cat does during the day while you're at work? Connect a wireless webcam—or three—and check in on Mittens from work.
4. **Become your neighbor's ISP**: Some cutting-edge Internet service providers have set up infrastructure to allow users share their DSL connection wirelessly. This gives your neighbor a fast cheap connection and can save you money on your monthly DSL bill. Speakeasy (www.speakeasy.net) started doing this first, and the company even provides the hardware to get your shared connection up and running.
5. **Participate in a community Wi-Fi network**: If you're feeling generous, most major cities have free wireless LANs. You can configure your access point so that any passerby who needs a net connection can tap into your broadband. You don't get anything in return, expect for the warm, fuzzy feeling that giving provides. Do it for the kids. Oh, and make sure you take the proper security precautions so that your personal files aren't exposed to the world.

You can use wireless webcams to check on your pets while you're away—or look out for intruders.

6. **Make free (or maybe just really, really cheap) phone calls**: Voice over IP (VoIP) calling gives you a super-cheap way to make long distance calls over the Internet. With a wireless handset and the right software, you can even use VoIP wirelessly.
7. **Cook dinner**: New ovens will be available later this year that have wireless connections to the Internet. What does that mean for you? Because the oven also includes a cooling element, you can put a casserole in the oven in the morning before you leave for work, keep it chilled all day long, and then log in to your oven at 3:00 p.m. to let it know you'll be home on time, so it can start cooking your covered dish.

Wi-Fi PC cards like these have started to become extinct; wireless networks are so pervasive that most portable devices now have built-in Wi-Fi capabilities.

Looking Ahead: Wireless Technology

It's entirely possible that over the next two years, Wi-Fi routers like this will be replaced by the 802.16 protocol. Also known as WiMax, this standard will make neighborhood wireless networks (provided by wireless Internet Service Providers) possible.

Maybe we're being naïve or overly optimistic, but in our minds, it's just a matter of time before 75% of all our networked devices utilize wireless networks. As transmission speeds, reliability, and security all continue to increase in quality, more and more networks—of the home, work, and neighborhood variety—will free themselves from wires. While it will be hard to defeat the massive speeds Gigabit Ethernet offers (which allows data transfer rates of 1GB per second), the freedom and the sheer possibilities Wi-Fi allows will be too attractive to resist.

Again, perhaps we're being naïve, but we see wireless as being pervasive in 5 years, and ubiquitous and completely integrated in most of the developed world's lives in 10 years. But let's not get ahead of ourselves—these are going to be the big developments of the next 12 months.

Wi-Fi hotspots everywhere: This one's a no-brainer. Hotspots are already ubiquitous in airports, malls, and coffee shops. This phenomenon will undoubtedly keep spreading; as an example, the San Francisco Giants' SBC Park now sports Wi-Fi access throughout the stadium. For commercial businesses, wireless access will become a necessary convenience, particularly as more and more consumers tote PDAs.

802.11n: On the wireless front, the big talk for the immediate future is 802.11n, the next big wireless networking standard. The working goal for 802.11n is to permit 100Mbit/s speeds with significantly less wasted bandwidth, much like the ubiquitous 100Mbit/s wired Ethernet standard. This is a dramatic improvement over today's wireless networking technology, which eats up to half of the available throughput for simple tasks like re-sending lost packets.

WiMax: Also known as 802.16, this spec is currently being hammered out by an Intel-led coalition, and may jeopardize the existence of DSL and cable Internet service in metropolitan areas. Essentially a standard for Metropolitan Area Networks, WiMax promises up to 70Mbps speeds up to *30 miles* away using microwave beams. That's impressive. But the real value is that 802.16 could allow Internet service providers to avoid running broadband through outdated cable coax and telephone lines. WiMax is currently undergoing testing in a few cities. Full implementations, however, aren't expected for at least two years or more.

"I'VE SAID IT A MILLION TIMES BEFORE, BUT I'LL SAY IT AGAIN: IF YOU DON'T SECURE YOUR WIRELESS NETWORK, YOU'RE ASKING FOR BIG-TIME TROUBLE."
—WILL SMITH, TECHNICAL EDITOR

Wireless USB: Imagine never having to plug in a USB cable again! Intel is pushing for a wireless USB spec that would create a low-cost, high-speed, short-range wireless technology that would work seamlessly with USB. WUSB is projecting speeds of 480Mbps at a range of under 10 feet, with 1Gbps on the roadmap. WUSB would use ultra-wideband technology and could mean the death of Bluetooth. Expect the first devices to surface next year.

Wireless personal networks: We're finally starting to see products that use the personal wireless network possibilities of Bluetooth to good effect this year, including PDAs, cell phones, mice, keyboards, and headsets. But another standard—802.15.3a—is currently under development by the IEEE, which aims to bring FireWire levels of speed and performance to wireless personal area networks. It's too early to tell whether 802.15.3a will complement or compete with Bluetooth.

Our Six Favorite Wireless Products of the Year

We deemed Microsoft's Wireless Base Station MN-700 the year's easiest router to install.

Easiest Router to Install
Microsoft Wireless Base Station MN-700

This 802.11g router is more enjoyable to configure than any other router we've ever seen. It walks even the rankest neophyte through the Wi-Fi configuration process, helping you choose the correct settings for security and reliability. ($110, www.microsoft.com/hardware)

Fastest Router
D-Link DI-624

By day, the DI-624 is an ordinary Wi-Fi router with a four-port hub that runs at a measly 54Mbits per second. But when you engage its special High Speed mode, it ratchets the speed up to 108Mb/sec by using more of the available spectrum. As long as you'll be using it with other D-Link devices in your home, the DI-624 is the ultimate router for high-speed wireless access. ($120, www.d-link.com)

The Ultimate Streaming Media Box
Slim Devices Squeezebox Wireless

You've got thousands of MP3s on your PC, but no way to listen to them on the kick-ass stereo in your living room. This common problem is easily solved with a simple Wi-Fi network and the Squeezebox. (www.slimdevices.com, $300)

Wi-Fi PC Card
The vast majority of Wi-Fi cards for laptops are virtually identical. Most have about the same performance, cost about the same price, and are made by the same two companies: Broadcom and Intersil. The only reason to choose one Wi-Fi card over another is that some vendors that use a chipset—like D-Link—enable higher than standard wireless transfer speeds when using hardware from the same vendor. (around $50)

Most Portable Wi-Fi Device
Linksys WUSB12

This penlight-size USB dongle adds Wi-Fi in seconds to any PC with a USB port. Its small size and convenient formfactor make it an easily transportable Wi-Fi solution for desktops or any other device with a USB port. (www.linksys.com, $70)

Best Wi-Fi Webcam
D-Link DCS 2100+

Plug this handy camera into an electrical outlet, configure it from any Wi-Fi enabled PC using the provided software, and you instantly have a webcam that you can place anywhere in range of your Wi-Fi access point. It can even stream a 320x240 MPEG4 video at 30 frames per second! (www.dlink.com, $380)

Best Wi-Fi Bridge
D-Link DWL-810+

To connect all your wired Ethernet devices to a wireless network, all you need is a Wi-Fi bridge, like the DWL-810+. Once it's configured, you can use cheap Ethernet hubs to connect as many wired devices as you need to your wireless LAN. (www.d-link.com, $130)

Chapter Fifteen

Digital Devices

Gadget lust got you? You're in the right chapter, friend.

Reader, be warned: Digital devices are good for you, but the objects and words you are about to read may cause the following side effects: spontaneous laughing, gaping, jaw dropping, drooling, overspending, and nightmares.

It took us several days to come up with a name for this chapter. After all, what kind of catch-all name can possibly capture the following types of objects?

- MP3 players
- PDAs
- Portable video players
- Printers
- Scanners
- Digital cameras
- GPS devices
- Portable USB keys

File this one under natural technological evolution: PDAs have sprouted Wi-Fi and 640×480 screens

Imagine the relief that flooded our arteries when we finally figured out a title: Digital Devices. The objects of lust, envy, scorn, obsession, and a considerable amount of media attention and consumer spending, the gadgets in this section attract more than their fair share of attention.

When you look at them, it's easy to understand why. We take our PCs and PC-related components for granted because we use them all the time and because they are, for the most part, vessels for our computing experiences. While *Maximum PC* views the computer and its parts with pure lust, the joy most people derive from their systems stems from playing games, browsing the web, processing pictures, and other tasks.

The joy we experience from digital devices, on the other hand, is much more direct. These gadgets—essentially specially adapted computers—enable, enhance, and ease our lives every day. And looks-wise, they are considerably sexier than PCs.

If it feels like these lifestyle-enabling devices are becoming more and more popular every month, you're right. Sales of these lusty objects has continuously increased over the last year. It seems like everyone has a digital camera these days. Or an MP3 player. Or a PDA. And those who do not have, want.

> ***THE JOY WE EXPERIENCE FROM DIGITAL DEVICES, ON THE OTHER HAND, IS MUCH MORE DIRECT.***

With this said, is it any wonder that gadgets, both small and large, continue to evolve at a rate that would make Darwin's head spin? From the increasing resolutions in PDAs to the debut of portable video players to the astonishing quality levels we've seen in color printers, it's clear that our lives are being and will continue to be heavily influenced and aided by this category of computer.

Let's take a look at the major categories of digital devices, shall we?

PDAs

Two years ago, we would have prognosticated that the days of Palm-related handheld computing would rapidly come to a close as the Windows-based Pocket PC platform gained popularity. However, this hasn't been the case.

While the Pocket PC's popularity soared from 2003 to 2004, Palm-based devices held their own, thanks to some innovative designs like the Palm Zire 71, and the early integration of the Palm OS into "smart phones" like the Palm Treo—cellular devices with integrated PDA functionality.

Nonetheless, the popularity of the Pocket PC platform surged forward as the year went on. Like us, users loved the ease with which Pocket PC devices synchronized with PC desktops. The fact that these PDAs also automatically sync with Microsoft Outlook's calendar and scheduling capabilities is another added bonus; to get such functionality from the Palm platform, you have to buy an add-on.

The presence of a Windows-based operating system allows users of Pocket PC based-devices numerous advantages over Palm-based PDAs. As an example, Pocket PC owners can easily listen to MP3s or view JPEG images, and can

Palm T3

As far as sequels go, T3 is horrible. Bad. Ugly. A big waste of money. Oh, wait, that's Arnold Schwarzenegger's last film. Palm's T3 is the exact opposite of the latest Terminator movie: It's a sequel that actually bests its predecessors.

Palm's new T3 delivered a well-designed portrait mode.

Among the most significant changes to the Tungsten T3 is a new landscape mode that makes for a more readable Internet browsing experience than most PDAs. And it couldn't be easier to use: When you flip the screen from vertical to horizontal, the directional pad automatically changes configuration. Palm also adds a virtual graffiti area to the T3 that offers backlighting for writing in the dark, easily converts to a keyboard for hunt-and-peck entry, and tucks away to give you more desktop space.

The T3's screen is a 320x480 transflective display that's sharp, bright, and offers fair off-axis viewing. The color depth is excellent, and although the screen and graphics controller have the same 16-bit rating as the Tungsten C, the T3 looks far superior. Speed-wise, the T3 operates at a snappy pace thanks to the 400MHz Intel Xscale CPU. Instead of skimping on memory, Palm wisely chose to use a full 64MB of RAM, 52MB of which are available to the user. Unfortunately, while onboard Bluetooth and a rechargeable Lithium Ion battery are included, the T3 lacks onboard Wi-Fi.

The Tungsten's biggest drawback is that none of its new features represent a breakthrough in technology or performance. The defunct HandERA (formerly TRG) had workable landscape modes years ago. Sony has long offered high-res screens in its PDAs. And the fastest Xscale has been calling the shots in other PDA bodies for many months now.

But this new handheld isn't really about being first—it's about integrating all these features into a polished, well-rounded package. Palm has accomplished that. The T3 is just the right size, and sports just the right amount of RAM and just the right amount of power. Overall, the Tungsten T3 is a cut above its predecessors and a fine PDA.

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MAXIMUM PC VERDICT 9

COLD PIZZA

Tiny and powerful, and contact info now tracks birthdays and instant messaging.

COLD CORN DOGS

Sticky power button.

$400, www.palm.com

even work on *Microsoft Office* documents such as *Word* files or *Excel* spreadsheets on their handhelds with few compatibility problems. Palm owners have to acquire add-on kits or software for much of this functionality.

So what do we look for in a PDA? First of all, the display has to be clearly visible in daytime and nighttime conditions, and the image must be sharp. Next we judge the device's feature set; the presence of options such as high-res modes, landscape modes, Wi-Fi, and BlueTooth wins points here, as do innovative data entry techniques and shortcuts. Next we consider functionality: Is the touch screen appropriately sensitive, and if not, can you adjust it? And how well do the synchronization options work? Finally, we consider intangibles such as battery life, bundled mobile apps, and overall appearance.

At the very end of 2003, we reviewed one Pocket PC that made a quantum leap forward. Toshiba's e805 Pocket PC blew us away by being the first PDA that allowed true 640x480 VGA resolutions. While the functionality was limited—you had to manually switch to the higher resolution and it wasn't available with all applications—we were still duly impressed. By the end of 2005,we expect most PDAs to run in this higher resolution.

Rise of the Smart Phones

As we approached the end of the summer, we began to see the convergence of two digital devices we had resigned ourselves to carrying around separately: the cell phone and the PDA. Dubbed "smart phones," these slick-looking gadgets allowed users to make phone calls from the same device that housed their calendars, contacts, and other mobile apps. The big perk was that built-in wireless technology allowed users to easily browse the web and check their email.

Up until now, the Palm platform has been the OS of choice for these smart phones; we expect to see many more Pocket PC-based devices in the coming months.

We have to say that we're enthused by this convergence; carrying around two separate handheld gadgets, each of which contained a unique set of contacts, always felt cumbersome and awkward to us.

Of course, for all the innovation in this category of computing—picture-taking, MP3-playing, Wi-Fi networking, to name a few examples—there are less fortunate creations. The most egregious example we can think of is Nokia's N-Gage. Released in the fall of 2003, this handheld gadget unsuccessfully merged a cell phone, PDA, and game device into a GameBoy Advance-sized unit.

This device sounded far better in theory than it felt in real life. The end result of this ambitious convergence was a platform that was vastly inferior in all aspects. To listen to the cell phone, you had to hold the N-Gage by its side; it felt like you were holding a taco to your ear! Playing games was similarly awkward; to insert a cartridge, you had to take out the unit's battery. Doh!

MAXIMUM PC KICK ASS PRODUCT

Toshiba e805

One of the most satisfying results of forking over a lot of dough for the latest technology is that it makes your friends look at their stuff with a sudden sense of embarrassing inadequacy. We call it the "locker room effect," and Toshiba's e805 handheld will have your peers blushing with envy when they check out its impressive *VGA* resolution. That's right: 640x480 on a Pocket PC screen—a first for the platform.

Dazzling and droolworthy, Toshiba's e805 introduces the finest screen ever to grace a Pocket PC. Can you say 640x480?

Squinting at this resolution on a 4-inch transreflective display may not sound like a great time, but the crispness, clarity, and brightness of the screen immediately won us over (and made us wish the unit came with some sort of screen protection, even a rudimentary sleeve, which it does not). Still, there's a hitch. Switching into VGA mode performs a soft reset on the device, and when the e805 assumes its 640x480 glory, you'll find that only four applications are available: *ClearVue Document*, *Spreadsheet*, *Presentation,* and *Image*. These apps will allow you to view Microsoft *Word*, *Excel,* and *PowerPoint* files, but you can't edit them.

As you'd expect from such a groundbreaking device, its guts are just as intimidating as its display. The e805 uses Intel's PXA263 proc running at 400MHz with 128MB SDRAM memory, and the video is powered by an ATI chip with an unprecedented 2MB of video memory. There's also 32MB of CMOS Flash ROM for the OS, and another 32MB Flash ROM disk that's protected from erasure during a hard reset for saving application data. CompactFlash (Type I and II) and an SD slot are available for external storage.

The e805's built-in microphone and speaker are huge improvements over previous Toshiba handhelds. We were pleased that the Wi-Fi range seemed to be slightly greater than that of the iPaq 5555. Unfortunately, the telescoping stylus is horrible, and needs to be jettisoned in the next revision.

With all this processing muscle, you'd expect the e805 to be a sweet gaming handheld. While its four-way d-pad can transform into a nice eight-way pad, a significant button lag is a real pain in the arse for action gaming. Otherwise, only the iPaq 5555 can challenge the e805 for quick arcade fixes.

Originally published March 2004

MAXIMUM PC VERDICT 9

+ SILVER SCREEN

Enough hardware muscle for games and video, and the exclusive VGA mode is breathtaking.

– BLUE SCREEN

Optimum VGA requires a third-party hack; very expensive; frustrating button lag.

$600, www.toshiba.com

MAXIMUM PC KICK ASS PRODUCT

Apple's 30GB iPod MP3 Player

When it comes to MP3 players, there's the iPod, and then there's everything else. It's kind of amusing watching other companies struggle to imitate the original iPod's ease of use and graceful design. So far, the only company that's succeeded in this effort has been Apple itself, with its third-generation, 30GB iPod.

The differences between this model and its predecessors could be likened to the differences between a beautiful suit that fits off the rack and one that's been tailor made—the changes are subtle, but deeply satisfying. Navigation duties (play, forward, reverse, and menu) have been moved from the ring around the scroll wheel on the original iPod to four touch-sensitive, backlit buttons above the wheel. Sharp edges have been banished from the exterior, and the entire unit weighs in at a mere 5.6 ounces.

The new iPod sports a multi-use proprietary connector at the bottom of the player and a dock that connects to a FireWire port. You can also purchase the optional USB 2.0 adapter ($20) if that suits your fancy. As with previous models, the iPod charges through the port it's connected to—even while you're downloading or listening to music. There's also a jack at the top of the player for the included remote, and a line-out jack for connecting to external speakers.

The iPod knocked our socks off with an easy-to-use interface and gorgeous looks.

Every function and every feature works exactly as you would expect it to. You can even create playlists on the fly by highlighting songs and pressing the center button for a couple of seconds.

Criticisms of the new design are hard to come by. We suppose it would've been cool if the navigation buttons were pressure-sensitive, so you could control the speed of scrolling or fast-forwarding by the degree to which you pressed the button. The bundled MusicMatch Jukebox Plus 7.5 software is nowhere near as easy to use as Apple's own iTunes. And, of course, it's extremely expensive.

But the 30GB iPod represents the very best of what Apple strives for as a company: The idea that technology should not only be easy to use, but a pleasure as well. We think the new iPod is worth every cent.

Originally published September 2003

MAXIMUM PC VERDICT 10

+ APPLE JUICE
The very, very best MP3 player we've ever used. If only all our *music* was this good.

– CLAMATO
High-priced and the bundled MusicMatch *Jukebox* restricts MP3 recording to 128kbps.

$500, www.apple.com

Portable Audio Devices

If it seems like there are 1,000 different MP3 players on the market today, that's because there are. Eager to cash in on the surging public popularity of digital music, scores of gadget makers released digital audio devices—we sometimes call them MP3 players, despite the fact that they play all manner of file formats—of all shapes and sizes.

The *Maximum PC* staff loves music; it's not rare to walk into our offices during deadline crunch and see three-quarters of the editors and designers with headphones on, listening to their private music collections. For this reason, and because we each have so many music files on our PC, MP3 players are one of the more enjoyable gadgets to review.

Reviewing these gadgets is a relatively straightforward process that revolves around one central question: How easy is the music player to use in day-to-day life? To test this, we copy our music library, which contains thousands of songs, to the player and use the device as if we had just purchased it—on walks, during our commute to work, and in our automobiles with the help of a tape cassette adapter.

It's usually clear within a day or two what the quality level of the interface is. If it's easy to call up and play our songs, we like it. If it's easy to transfer files from our PC to the device being tested, we like it. If it can play all manner of songs, including various bitrates

and file formats, we like it. If it hangs or crashes, or chokes on certain file types, we hate it.

Going into the summer of 2003, the iPod—the Sony Walkman of its time—dominated the headlines and the mindshare of the mainstream and technical press. Its sleek, shiny appearance and elegant, easy-to-use interface won Apple's first music player rave reviews. Additionally, the player's innovative and immediate integration with iTunes, Apple's online music service, made transferring songs—both downloaded and purchased—easier than it had ever been.

Unfortunately, PC users had to wait until the holiday season to use the iPod with their computers. When this release date rolled around, Mac-haters across the country set aside their differences and snapped up the PC-compatible iPods. The only downside to Apple's music device, which is reviewed on page 192: the exorbitant cost.

The surging popularity of the iPod heightened public interest in portable audio gadgets of all types. Every company from Dell to Gateway jumped into the category. The result was a proliferation of hard drive– and memory-based devices.

As the end of our year came in the summer of 2004, we began to see the first audio devices based on the newly developed tiny hard drives described in Chapter 6, "Hard Drives." Apple's mini-iPod and Creative's Muvo 2 were among the first products to be released in what we estimate will become a new category of portable audio that will supplement the existing drive-based and memory-based categories.

Portable Video Makes Its Debut

Hot on the heels of portable audio, lightweight personal video players made their debut in the middle of 2004. Unfortunately, our first experiences with these futuristic gadgets left us unimpressed and wondering about the viability of this type of device.

MAXIMUM PC KICK ASS PRODUCT

MuVo TX

Creative's sassy two-piece keeps getting better; now it's got 512MB of built-in storage.

With each iteration, Creative Labs keeps honing and refining its marvelous two-piece MuVo MP3 player. At this point, the tiny product excellently showcases all the advantages solid-state players have over their hard drive-based counterparts.

Try to find a hard drive–based player that takes less than three seconds to power up and begin playing your MP3s. Or one that's only 2.75 inches long and .25 inches thick, which is slightly smaller than a middle finger being raised at Apple's mini iPod. And how about 12 hours of play time at maximum volume? The MuVo TX boasts all these features.

There's plenty more to love, like the whopping 512MB of internal memory. It's not expandable, but if you need more than 512MB, a hard drive player would probably serve you better anyway. The MuVo TX also doesn't require any software or drivers, although Creative's *MediaSource* is included in case you need an MP3 ripper and software player. And, like the previous-generation MuVo NX, the controls have been whittled down to a well-thought-out minimum, with a prominent play/pause button, volume up/down, and a multifunction scroll wheel.

The MuVo TX throws in a voice recorder, variable bit rate MP3 support, and—thank heavens—true high-speed USB 2.0 support. It also allows you to transfer and play back the contents of folders, although it will only recognize one level deep, meaning that nested folders will be ignored.

Originally published May 2004

MuVo TX

MAXIMUM PC VERDICT 9

EARS

Oodles of flash storage, USB 2.0 support; a new high for solid-state MP3 players.

EARWIGS

Memory isn't expandable. The usual crappy earbuds.

$270, www.muvo.com

Although we're skeptical of how popular portable video players will ever be—who wants to watch a movie on a 4x4 inch screen?—we still appreciate the convenience of being able to take your favorite movies, TV shows, and other video files with you wherever you go. This convenience is amplified by the fact that you can plug most of them into TVs and monitors.

However, as we began to test these devices—we view a library of video files encoded in various file formats and at various bit rates—we began to find ourselves concerned over how the mainstream public would use these players. For the business traveler, it's a no-brainer; being able to watch your own movies rather than the bland entertainment offered by airlines and hotels is a huge plus.

But what about the rest of us? And how will the emerging notions of digital copyrights and built-into-the-OS digital rights management (DRM) affect the accessibility of video imagery? If you can't copy video from your PC-based Media Center to your portable media player because of strict DRM, what's the use of a video-based device?

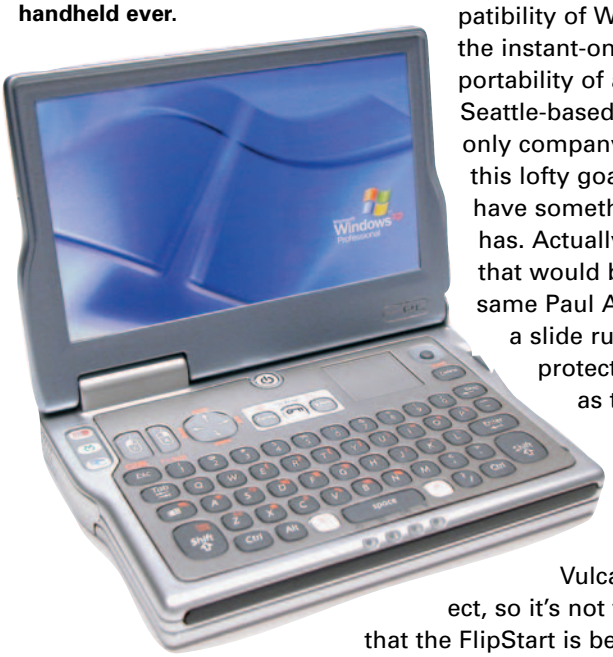
One thing's for sure: As we enter 2005, we'll be watching this category of digital device very closely.

Digital Cameras

The increasing popularity of digital audio devices like the iPod has been mirrored by a similar surge of interest in digital photography. The heightened interest in technology has been part of the reason behind this increased popularity. But a

Preview: The FlipStart miniPC

At 5.8 × 4 × 1 inches, the FlipStart should be the smallest XP-bearing handheld ever.



The idea is simple: Combine the power, flexibility, and compatibility of Windows XP with the instant-on, always-available portability of a handheld. Seattle-based Vulcan isn't the only company working toward this lofty goal, but it does have something no one else has. Actually, some*one*, and that would be Paul Allen, the same Paul Allen who shared a slide rule and pocket protector with Bill Gates as they launched Microsoft.

Ever the visionary, Allen founded and initiated Vulcan's miniPC project, so it's not terribly surprising that the FlipStart is being built to run Windows XP (both Home and Professional). The specs are impressive for a device this size: a 1GHz Transmeta Crusoe processor, 256MB RAM, a 30GB internal hard drive and—get this!—a 5.6-inch screen that supports resolutions up to 1024x600. The FlipStart will also sport 3D graphics with 8MB of video RAM, and feature USB 2.0 and integrated 802.11b and 802.11g. Amazingly, the whole ball of wax will weigh just a single pound.

Navigation and text entry don't require external peripherals; the FlipStart has a built-in thumb keyboard, trackpad, scroll wheel, and left/right mouse buttons. You'll even be able to hook up an external keyboard and mouse via the USB ports.

Another interesting twist is the "low-powered interactive display" (LID) module, a touch-sensitive, monochrome external display that lets you check your email or scroll through an MP3 playlist without having to power up the built-in color LCD screen. Unfortunately, Vulcan wouldn't reveal how this external device will clamp onto the FlipStart. We suspect that a slightly more sophisticated technique than a rubber band or Velcro will be used.

Vulcan hasn't committed to a release date or price, but it's clear the company would like to see FlipStarts everywhere by this holiday season. So if you want a real PC in your pocket, start saving now.

Originally published May 2004

Lyra RD2780 Audio/Video Jukebox

It looks nice, but there's enough going wrong in the Lyra RD2780 to qualify for "state of emergency" federal aid.

Portable video players based on Microsoft's Portable Media Center OS are receiving their final teeth-whitening treatments before their big fall rollout. We've already seen one winner in Archos' expensive-but-hella-fun AV320; now we've got a loser to even the scales in RCA's Lyra RD2780.

The RD2780 looks sleeker and is slightly lighter than Archos' AV320. The black fascia makes the 320x240 screen appear to be much bigger than it is, and at 3.5 inches diagonally, it's actually a little smaller than that of the AV320 (which is 3.8 inches diagonally).

But screen size doesn't matter if your files won't play, which was often our experience with the RD2780. We were able to play only *one* of our five downloaded DivX and Xvid test videos, which are recorded at different bitrates. Conversely, every one of them played fine on the AV320.

It gets worse, as we learned when evaluating the handful of movies that came preloaded on our review unit. The image quality wasn't bad—at least, until we saw nighttime scenes, or any scene with dark colors in it, for that matter. Regardless of the bitrate of the video, the Lyra displays terrible, blocky pixilation when it comes to flat black shades. We plugged the unit into a TV via the included component-out cable and the blocky images made our guests flee for the kitchen. We hoped that upgrading the firmware on the player would solve both problems, but it didn't.

The videos we encoded ourselves using *VirtualDub* played back without any problems (except for, of course, the pixilation in dark colors); unfortunately, RCA doesn't include this freeware app, or any video compression software at all, leaving you completely on your own to transport commercial titles to the player. What the Lyra will do, however, is record a signal from your television or VCR and automatically compress it. Unfortunately, most commercial VHS tapes and DVDs are copy protected with Macrovision, which degrades the signal and prevents you from taking your movies on the go. But, hey, you can still record the network premiere of *Kill Bill*—with all the blood and bad language taken out.

Rounding out the Lyra's woes, the internal, nonremovable lithium-ion battery pooped out after 2:25 (hours:minutes), about 45 minutes sooner than the Archos AV320.

Originally published July 2004

MAXIMUM PC VERDICT 3

+ CAN-CAN
Retailers often allow up to 30 days for returns.

– PAN 'N SCAN
Some don't.

$450, www.rca.com

bigger reason was that digicams have become less expensive, and the technology has improved to the point where it's very close in quality to traditional film.

Combine this with the instant results nature of digital photography, the ability to take as many pictures as you want, and the increased quality of color inkjet printers, and you have a trend in the making.

When the *Maximum PC* editors review digital cameras, we pay close attention to a few key categories, described below:

Resolution: What are the maximum number of megapixels captured at the camera's highest resolution? The higher the megapixel count, the higher the resultant quality of image. These days, even inexpensive, basic digicams offer more than 4 megapixels of resolution. The high-end cameras offer more than 8.

Lag-time: Up until this year, most digicams have suffered from the same basic flaw—an ungainly delay when you press the shutter button, resulting in missed moments and frustration on the photographer's part. Photographically speaking, there is nothing worse than missing a spur-of-the-moment shot because of digicam lag. Regretfully, this functionality is often overlooked by first-time camera buyers. Thankfully, manufacturers have begun to eliminate this flaw in the current crop of cameras, to which we say: Huzzah!

Flash: Unlike traditional 35mm cameras, you can't replace the flash of a digital camera. For this reason, it's important that the built-in flash isn't too bright—or too faint. Too bright a flash will wash out every single image you take. Even with

Sony Puppy

The Puppy is Sony's entry into the burgeoning field of biometric security. Biometrics works by assessing our unique biological characteristics. The idea is that the patterns in our retinas and fingerprints are much more distinct—and unhackable—than any password we might think up. The unfortunately named Puppy is a fingerprint scanner, and allows you to replace common Windows passwords with your fingerprint.

Like a wee watchdog, this little device will guard the contents of your PC.

The Puppy works much like other fingerprint scanners we've tested. You plug it into a powered USB port, install some drivers that hook into the basic Windows login process, and then replace your Windows password—as well as any other passwords—with your fingerprint. Once we registered our fingers, we experienced a very high success rate with recognition. We attribute the accuracy to the Puppy's silicon sensor chip. It measures ridges and valleys in fingerprints by using electrical capacitance instead of an optical sensor.

The Puppy also encrypts your files, using either a 512- or 1024-bit RSA encryption key. Unfortunately, the Puppy software lacks a "Decrypt to Memory" feature, so anytime you decrypt a file, the Puppy saves the unencrypted file on your hard disk. This could be a problem for the truly paranoid: If you're not frequently wiping your drive of data, anyone who gains access to the drive could conceivably re-create the unencrypted files from the remnants left on the platters. Offering an option that decrypts to volatile memory could preclude this possibility.

We tried to fake out our Puppy by replacing our finger with common objects. It wasn't fooled by photocopies of the finger in question, and we couldn't confuse it by wiggling our fingers during the scan.

But there are a couple of annoyances. Having to specify which finger you're using anytime you use a digit other than the default digit sucks. After all, if you take the time to register all your fingers, the Puppy should be able to automatically recognize any finger you put on the sensor. Also, the Puppy doesn't work with Fast User Switching enabled. You have to use the old-fashioned login screen. The Puppy is competitively priced at $140, and has all the basic functionality we require in a biometric device. Still, it doesn't add any compelling new features to the thumb-scanner security category.

Originally published December 2003

MAXIMUM PC VERDICT 8

CORGI

You can forget your 20-character passwords if you have the Puppy and a finger!

PIT BULL

It doesn't look, smell, or taste like a dog. Why the hell is it called the Puppy?

$140, www.sony.com/puppy

the ability to use image-oriented software like *Photoshop* to correct over-exposed images, this effect can be disastrous.

Image Quality: Without a doubt, image quality can be a deal-maker or a deal-breaker. It's the first thing we check when testing a camera; we immediately shoot a few shots at the default setting to gauge the relative quality level. One thing in particular that we look for is the presence of ugly moiré patterns—oddly colored banding and striping around patterns like fences—in the photos we take.

Features: These days, even the most basic of cameras are chock-full of features. With this in mind, we pay special attention to what kind of features are included. We expect to see condition-specific picture-taking modes such as high shutter speed sports mode, low light mode, and portrait mode; if these are absent, a camera will lose points in our review rating. Other features, like continuous rapid shooting, or panorama mode, are always appreciated.

If we've witnessed any trend over the last year, it's been that digicams are getting more affordable by the month, and that they're also becoming increasingly packed with features that were formerly only found in high-end cameras. One other trend we appreciate that we're seeing: cameras that, like traditional 35mm units, allow the user a wide range of automatic and manual options.

The cameras that really warm our heart, though, are the digital 35mm devices that allow us to use our existing arsenal of wide-angle, zoom, and combo 35mm lenses.

Printers

One big reason digicams have increased in popularity is that printers have become more capable of printing photograph-quality images. By using more nozzles for finer resolution and an increased number of ink tanks for sharper colors, high-end color inkjet printers, which have plummeted in price in recent months, are now able to output high-quality text and photographs.

In addition to the leap inkjets have taken, personal laser printers have also increased in popularity. Low prices, high reliability, and blazing fast print speeds are to blame.

Unfortunately, color laser printers still can't compete successfully with the color output quality of inkjets. But they're starting to catch up. In our May issue we compared a color inkjet to a color laser, and were surprised at the relative quality the laser printer put forth. While it wasn't nearly as sharp as the photographs we printed on the inkjet, we began to feel that someday the technology will catch up. This is a good thing—we prefer the lower costs and faster output of laser printing.

Nikon D70

Nikon's new D70 digital SLR body should have cost-conscious F-mount fans doing cartwheels. At $1,000 for the body, which is plastic but sturdy, the D70 is an amazing tool with many features that outstrip cameras costing $500 more.

Nikon's 6-megapixel D70 offers features that can't be found in cameras that cost $500 more.

Among the camera's most impressive attributes is its buffering ability. Use a high-speed CF card, set the D70 to "normal" resolution (1:8 JPEG compression versus 1:4), and you can hold down the shutter release until the compact flash card fills up at 3fps with no slowdown. Every other digital SLR on the market (including more expensive professional models) bogs down after the buffer's been filled, but not the D70. Nikon says you can shoot about 144 photos before the camera slows down, but we were able to capture more than 150 images at the "fine" setting.

We did find, however, that as the ISO ramps up to 1600, the noise—similar to graininess in high-speed film—became more pronounced. While far cleaner than most 1600 speed films, the CCD imager is definitely inferior to the CMOS sensors used in Canon's digital SLR cameras.

More troubling to us are the moiré patterns that appear in images produced by the D70. Moiré patterns occur when a fine pattern, like a row of houses, or even a tweed jacket, interacts with the fine mesh of photoreceptors in a camera, resulting in a series of colored bands in photographs. Most digital cameras exhibit some moiré at times, but with the D70, it's more noticeable.

While the D70 can't beat the competition in moiré, it's got the edge in user tweaks. If you want the camera to, say, switch to a higher ISO speed when you hit 1/30 of a second instead of 1/60, you can do that. The D70's electro/mechanical shutter also lets the camera sync at 1/500 of a second. This lets you shoot with a flash at higher shutter speeds.

The D70's focusing capabilities are another story. The focus point system—borrowed from Nikon's $250 film SLRs—is hard to read, a flaw that's compounded by the viewfinder's smaller-than-average size. Furthermore, the D70 doesn't let you change focus modes without digging into the menu.

Originally published June 2004

MAXIMUM PC VERDICT 9

+ VELVIA

Incredibly fast performance and 1/500 sync speed.

– VELVEETA

Noticeable moiré, and unable to easily change autofocus modes.

$1,000 body only ($1,300 with 18-70mm F/3.5-4.5 lens), www.nikonusa.com

Our Five Favorite Gadgets of the Year

Mini iPod

In 2003, we fell in love with Apple's cool-looking iPod. In 2004, our love affair was renewed; the tiny iPod measured just a few inches by a few inches and boasted all the goodies of the original iPod like a contact database, a calendar, and four games. The only downside: 4GB of storage space. Still though, for its diminutive footprint, even this was hard to beat.

Muvo TX

Elegantly refined and ultra-portable, Creative's MuVo line of media players knocked us out with a whopping 512MB of storage capabilities and an easily understood interface. Our most positive impressions, however, stem from two features: We can plug it into any WinXP-based system without using drivers, and we can also use it to transport our data files.

Archos AV320

In stark contrast to RCA's Lyra video player (reviewed on page 195), Archos' video player wowed us by being the very first—and as of our print deadline—the very best portable player. The secret: close to 100% compatibility with our daunting suite of videos, which feature a slew of different bitrates and file sizes.

Toshiba e805

Two numbers can best sum up this Kick Ass award-winning PDA: 640 and 480. The very first Pocket PC to allow high resolution display, the Toshiba e805 (reviewed on page 191) also boasted Wi-Fi capabilities.

Roomba

The little automated vacuum that could, the Roomba won our hearts in December 2003 for its spunky, no-holds-barred approach to household vacuum cleaning. Sure, it's loud, and it struggled with the loose strands of Persian-style rugs. But it's impossible to not love an AI-based vacuum.

Looking Ahead: Digital Devices

It's clear to us that portable media players have just begun to rise to the forefront of the public's imagination. In the future, we expect them to get smaller, more functional, and cooler-looking.

The future is bright for gadget-lovers—all manner of futuristic devices are in store.

Brace yourself. At times, the coming 12 months will feel like they literally revolve around digital devices. As more consumers learn how much easier, entertaining, and productive PC-based devices can make them, gadgets will become increasingly popular.

And then there's the broadening effect Wi-Fi will have on digital lifestyles. We expect wireless networking to become the glue that connects all these handheld devices together and to our home PCs. Already present in PDAs and even some forward-looking MP3-based car stereos, this untethered form of networking will allow for unprecedented (and unscalably imaginable) functionality.

Here's what we expect to see from the major categories:

PDAs: It's clear to us that, in some way, shape, or form, PDAs are the future of not just portable computing, but computing in general. In 5 or 10 years, we'll all carry pocket-sized computers that will keep our schedules, make phone calls, function as media players, and allow us to compute on the go.

In the short term, we anticipate that PDAs will all begin to shift to higher resolutions, or at least allow for this option. The really big news on the PDA front, however, is that late in 2004 or early 2005, we'll see the first ultra micro-portable PCs. Weighing in under a pound, these devices aren't so much gadgets as fully-realized miniature computers. Several are in the works; we can't wait to get our hands on them.

Media players: Music players have become established, Video players are forthcoming…so what's ahead for portable media devices?

One of the big product releases of 2004 will be Microsoft's MP3 player, which will launch in conjunction with the company's music downloading service.

On the iPod front, wild rumors have been flying that Apple's next iPod is going to push more than just audio. Apple has denied that a video iPod is in the works, but we suspect otherwise. After all, what better way to pimp QuickTime, the company's own ailing video format?

Digital rights management: In 2004, we'll see the first generation of media players based on Microsoft's Windows XP-based portable media player operating system. We're intrigued to see what type of functionality Microsoft brings to the media player table, but we're more curious about the much-anticipated debut of digital rights management.

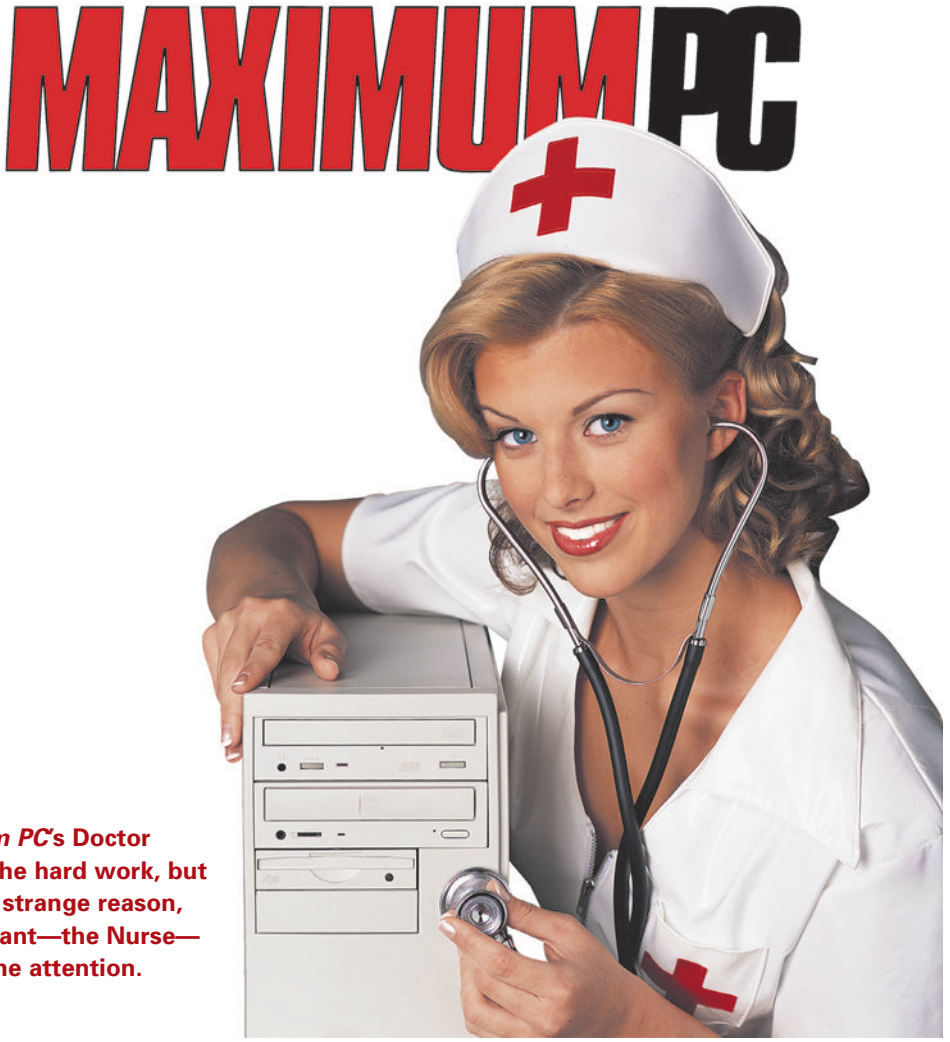
Commonly referred to as DRM, this method of protecting copyrighted movies, music, and other media will be hardwired into Windows-based media players. Microsoft has promised that DRM will be flexible enough to support a variety of business models, including downloadable files and physically transferred media.

"FOR EVERY ONE EXQUISITE DIGITAL DEVICE I'VE REVIEWED, I'VE SUFFERED THROUGH 3 OR 4 OTHERS."
—LOGAN DECKER, FEATURES EDITOR

Chapter Sixteen

Ask the Doctor

Got a PC-related problem? Ask Maximum PC's troubleshooting Doctor—he has all the answers.



***Maximum PC*'s Doctor does all the hard work, but for some strange reason, his assistant—the Nurse—gets all the attention.**

Just like a refreshing sip of lemonade, *Maximum PC*'s "Ask the Doctor" section serves up a monthly dose of hardware healing and software solutions. Each issue of *Maximum PC*, our Doctor wades through hundreds, if not thousands of emails and selects the most common and/or pressing questions.

Regular readers of *Maximum PC* are already familiar with the Doctor's good deeds and vast knowledge. If you've never read *Maximum PC*, you're about to discover first-hand why he is one of the most respected PC answer guys on the planet.

The problems the Doctor confronts usually fall into one of three different categories:

My *X* won't work: Hey, things break, particularly if you lead an upgrade-intensive lifestyle. These kinds of questions are the toughest to answer because the Doctor has to speculate the cause of the problem.

I have an upgrading question: Frequent upgraders often submit questions to the doctor about their upgrade paths, mobo-CPU compatibilities, and purchasing recommendations across all component categories. Thankfully, the Doctor has a library of knowledge at his fingertips in the shape of the *Maximum PC* Lab staff.

How does *X* work?: The Doctor is often asked to explain the way components, technologies, and even operating systems work. To our expert, these are the most entertaining challenges of all; explaining the complex inner workings of a sophisticated piece of hardware or software in precise and easily understandable language always makes for a good time.

This chapter includes our favorite "Ask the Doctor" questions and answers from the past year. Boiling down a year's worth of our resident expert's troubleshooting tips and PC help wasn't easy. We selected questions and answers that we felt were particularly interesting and helpful, or most applicable to a large portion of PC users. Additionally, we've called out our most favorite Doctor questions of the year in ongoing sidebars that run alongside the monthly questions.

Ever wonder how using off-brand media will affect your expensive new multiformat DVD recordable drive? The Doctor has answers! (See page 203 for the answer to this.)

As you read through our best "Ask the Doctor" questions of the year, you'll probably find yourself in awe of the Doctor's knowledge. Don't worry; this is a typical response of the uninitiated. The wonder passes after a few years.

> ***AS YOU READ THROUGH OUR BEST 'ASK THE DOCTOR' QUESTIONS OF THE YEAR, YOU'LL PROBABLY FIND YOURSELF IN AWE…***

One final note: Even to those who only occasionally read *Maximum PC*, the Doctor is always on call; if your PC has a malady not mentioned here, send an email with your name, address, and phone number to doctor@maximumpc.com. Please keep in mind, however: The Doctor gets a lot of email and can't respond to everyone.

July 2003

Getting MP3s to My Stereo?

I've amassed quite an MP3 collection over the past few years, and I would like to listen to my music on my home stereo. My problem is that my stereo is located in a different part of the house from my PC, and I don't want to run a 2000-foot wire from my Audigy card to my stereo. Is there a wireless way I could do this?

—Neil Gardner

Two years ago, there were lots of products that were purported to do just that, but most of them didn't work well in real-word situations. Your best bet is to use a wired product, such as the SonicBlue Digital Audio Receiver or the Turtle Beach AudioTron, in combination with an 802.11b-to-100baseT Ethernet bridge, such as the Linksys WET11.

Just make sure that the music server and your playback device are on the same segment of the LAN. If they don't share a subnet—that is, if their IP addresses don't start with the same first three sets of numbers—you'll have problems getting them to connect. If they're on the same subnet, the MP3 playback device will think it's connected directly to your wired LAN, and should do exactly what you want.

Mouse Miasma

I have a strange problem that I have never seen before. My mother-in-law's PC is running WinXP. Her mouse arrow is stuck in the middle of the screen and isn't functional. I looked for the device in Device Manager and there's no entry for mice and/or pointing devices. I've tried rebooting, powering down the system, using a PS/2-to-serial adapter, using System Restore to revert to a time before the problem occurred, using a good mouse, and installing a new copy of Windows on top of the old one.

—Steve Lampkin

You've taken a lot of steps that the Doctor would recommend, but there are a few more things you can do. We recommend trying a USB mouse. It's entirely possible that your mom-in-law fried her PS/2 port, and most mice these days don't work with PS/2-to-serial adapters.

You should also uninstall the crapware that comes with aftermarket mice, such as the *Mouseware* or *Intellimouse* apps.

If neither of these things fixes the problem, it's probably time for a clean wipe and a reinstall of XP. Sometimes that's the only way to be sure.

RAMDAC Recon

I recently purchased an ATI Radeon 9000 Pro 64MB. ATI's web site claims the card has dual 400MHZ RAMDACs. I have every possible driver updated for everything on my PC, including the latest Catalyst version. However, under the Adapter tab in Display Properties, the DAC type is listed as InternalDAC (350MHz).

Why doesn't it read 400MHz as the card supposedly runs? I called ATI and some tech support guy told me, "It shows 350MHz because that's what it's currently running at. It has the capability to run at 400MHz depending on what you are currently using the card for." I play games like *UT2003*, and I'd think that would benefit from the extra 50MHz. I also highly doubt that the adapter info changes according to what is currently running.

—Mike Roll

A 350MHz RAMDAC on a 9000 board is odd, but it's not cause for concern, unless you regularly find yourself using resolutions greater than 1600x1200. A slow RAMDAC isn't capable of outputting the ultra-high resolutions of a 400MHz RAMDAC, but doesn't affect your performance at resolutions it does support.

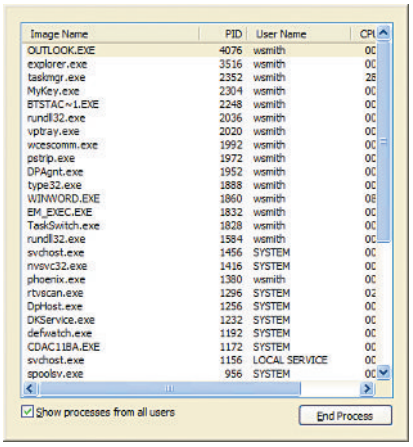
The RAMDAC speed simply defines the maximum resolution and refresh rate that your card can output to a monitor. If you're playing games at 1024x768 and 1280x1024, there's no effective difference between a 350MHz and 400MHz RAMDAC. That extra 50MHz doesn't slow your PC down at all. It just lets you run 2048x1536 at, say, 85Hz instead of a mere 75Hz refresh rate.

What's perplexing is that our 9000 Pro does show a 400MHz RAMDAC. We suspect you might have an OEM version of the 9000 Pro, which could have different specs than the retail packaged boxes. ATI doesn't guarantee that OEM, or white box, cards have the same specs as cards purchased in retail packaging.

Testy Task Manager

I'm using WinXP, and whenever I press Ctrl+Alt+Delete to bring up the Task Manager, it's missing the portion with the tabs and menu choices. I can't figure out how to get to the Applications screen; it's stuck on the CPU usage screen. It doesn't have a title bar or the normal maximize, minimize, and close icons in the top-right either. Please help.
—MG

We're pretty certain the Doctor's covered this one before, but we'll hit it again just for you, MG. You must have inadvertently double-clicked on some grey space inside the Task Manager window. That action hides the normal menus and tabs, just like you described. To get them back, all you have to do is again double-click on a grey area in the window. As for the utility of this furtive feature, we're at a loss.



For some reason, Task Manager has a minimal-interface mode that hides everything but the tab you're using.

August 2003

I'll Burn It My Way

My Pioneer DVR-A05 is listed as a 4x DVD recordable drive. But when I use reasonably priced locally available DVD-R media, it burns at just 1x. I spoke with a buddy who bought the A04 and he is able to burn the same brand media that I use at 2x without any problems.

The tech guys at Pioneer have offered a number of different explanations, including that having more than one piece of burning software on my system would cause the burn speed of my drive to slow down. They also said that they couldn't help me with *Nero*—my preferred burning software—since they only offer *Easy CD Creator* with the drive. I don't want to risk installing *Easy CD Creator* because I've read that *Nero* and *Easy CD Creator* do not play well together.

The second question I have pertains to the "no stickers" icon inside the jewel cases of some expensive Apple 4x DVD-R media. I called Apple, and was told that adding a conventional CD-type label could cause the platter to go off balance. Are they just being overly cautious, or is there something to what they say?

—Tom

All the questions you've asked—from using off-brand media to installing your own burn software—involve doing things that aren't recommended by your drive's manufacturer. And when you stray from manufacturer recommendations, you're probably going to encounter some problems. Let's look at some of those problems and establish how serious they could be.

The media: Even if your software supports it, we don't recommend overriding the maximum write speed for your disc as determined by your drive. Ever. You're likely to end up with discs that are riddled with errors (which you won't discover until you try to access files near the middle or end of the disc), or that are incompatible with any other drive than the one you burned it on. If you want a quality, fast burn, stick with quality, brand-name media. Preferably the brand recommended by your drive manufacturer.

The software: You're right about *Nero* and *Easy CD Creator*—they're like Seinfeld and Newman in the same building. *Nero*'s great, but you might just try uninstalling it and trying out *Easy CD Creator*, which has vastly improved in the last year. You can always go back.

The stickers: A label that is placed even slightly off-center will result in a very slow burn-time (sub-1x) or a failed burn altogether. And the Doctor has found that putting stickers on discs dramatically reduces their compatibility with other players, especially set-top boxes. It's your call. If you want to get fancy, consider Epson's Stylus Photo 900 ($200, www.epson.com), reviewed last month, that prints directly on the surface of discs.

Five Questions with the Doctor

To avoid being accosted at all hours of the day and night, we maintain a strict shroud of secrecy over our Doctor's identity. However, we did corner him for a few quick non-tech related questions. Here's what he had to say.

Q: How'd you get started?

Doctor: Countless years of IT experience gave me the info and experience I needed to answer everyone's questions, which I've been doing since the July 2000 issue.

Q: How many emails do you get a day/week/month?

Doctor: I get up to a maximum of 1,000 messages a month, not including spam. If you include spam, this number balloons beyond the 10,000 message range.

Q: How do you select the emails that you answer?

Doctor: I look for two types of questions: general questions that can benefit *Maximum PC*'s entire audience, and odd or bizarre questions that are just fun to read about. If I notice a common theme among a month's batch of questions, like the problems with Via chipsets and SoundBlaster cards I wrote about in 2003, I definitely try to pick out a representative question and answer it.

Q: What kind of challenge does it present to try to solve PC problems in computers that you never, ever see?

Doctor: Trying to solve a problem that we can't replicate in the Lab is extremely difficult. When that happens, I almost always turn to the Internet, the residents of several different PC hardware forums—including *Maximum PC*'s—and as a last resort, to Google.

Q: What kind of advice or evergreen instructions would you give PC users who encounter problems of their own?

Doctor: The number one problem we hear about is instability in videogames. Nine times out of ten, that instability is due to outdated chipset drivers. Whenever you update your videocard's drivers, go to your motherboard chipset manufacturer's page and check to ensure that you're running the latest version of the drivers for your mobo.

Disorienting DVD Recordables

I'm a little confused about DVD nomenclature. What are the differences between +R and -R, +RW and –RW? I know Sony makes a drive that writes in all these formats and that you highly recommend it. What do the different modes represent, and why would I need one over the other?

—Jim Miller

If you are only "a little confused" about DVD standards then you're not in bad shape. We covered the technical differences in September 2001 ("Beyond the X-Rating"), and not much has changed since then. Here's the three-paragraph rundown version of that story.

CD burners have a write-once format (CD-R) and a rewriteable format (CD-RW). DVD burners have two write-once formats (DVD+R and DVD-R) and two rewriteable formats (DVD+RW and DVD-RW). The dual formats are the result of an ugly "Pioneer versus everyone else" standards war—one in which there was never a clear winner.

The effective differences between the formats are slight. In the Doctor's experience, DVD-RW discs tend to be more compatible with set-top players than DVD+RW discs. But how useful is it to be able to rewrite to your DVD Video discs? Not much, in our opinion. And the compatibility of the write-once formats is virtually the same.

Most manufacturers are moving toward dual-format drives. Having a dual-format drive means you can make test discs in all four formats to see which ones are most compatible with your DVD-ROMs and set-top devices.

Let's hope the next generation of optical technology will go a little more smoothly.

September 2003

Analog or Digital for the Best Sound?

I just got a new Area 51 system from Alienware with an Audigy 2 Platinum soundcard and Logitech Z-680 speakers. What cable do I need to plug into the digital connector on the soundcard and the speakers? Both ends look the same, but they're different. I talked to several people at stores and nobody has any idea what I need or where to find it. The analog sound is good, but digital sound is what I really want.

—Mark Schuetz

What you need is a Toslink optical connector, and it can be found at most electronics and audio stores. The optical input on the speakers should be identical to the optical output on the soundcard. It doesn't matter which end of the cable goes with which connector. If you're having problems connecting the cable, either the cable is misaligned or one of the connectors is defective.

That said, the best option for Audigy users is the analog connectors. The Audigy doesn't encode DirectSound3D audio streams into the DolbyDigital 5.1 format that digital speakers require. Instead, 3D positional data is discarded and all sound is sent over the digital connection in a stereo format. That means your expensive 5.1 speaker set is functionally identical to a 2.1 rig for games if you use the digital output. As a general rule, you should always use the analog connection with PC speakers.

The only exception to the "use analog" rule involves nForce mobos sporting the MCP-T southbridge, which has integrated sound. Those boards can encode DirectSound3D into a Dolby Digital 5.1 stream in real-time, and will work best in digital mode.

Soundcard Sounds Scratchy

Whenever I play WMA or MP3 files saved on my hard drive and there's any short intense hard drive activity, I get a scratchy spitting sound from the speakers.

CD Audio works OK and DVDs play fine except for a short spit in the sound when the DVD starts up. Another oddity is that the Windows startup WAV file stutters as soon as the desktop appears.

I haven't made any changes to this PC for quite some time—other than the standard Windows updates.

I've pulled and re-routed all the power connectors to keep them away (as much as possible) from the IDE cables. I switched power connectors to all the hard drives to eliminate any possible loose connections. I've pulled the soundcard, NIC, and RAM from the PC and used canned air to clean out all the connectors. I've re-inserted all the IDE cables and checked for kinks and visible damage. And I've updated the drivers for my Audigy Gamer, RAID array, and motherboard (an Abit KT7A with HPT 370 UDMA RAID controller).

—Kari Vahaaho

The problem you describe isn't new. Your Abit KT7A-RAID motherboard uses the VIA KT133A chipset, which includes the VIA VT82C686B southbridge. The 686B southbridge is well known for being incompatible with the Sound Blaster Live! and Sound Blaster Audigy cards. Most of the problems are related to the Live!, and involve the interaction between the Live! and VIA southbridge when transferring data. VIA blames Creative Labs, and Creative Labs blames VIA.

Originally some motherboard manufacturers tried to correct it, but VIA finally released 4-in-1 drivers that detected the presence of a Sound Blaster Live! and made appropriate corrections. Abit goes even further, offering three possible fixes: The first is to try the latest 4-in-1 drivers. The second is to adjust the PCI timing in the motherboard: Try setting the PCI Master Read Caching to "disabled;" the PCI Delay Transaction to "disabled;" and the PCI Master Bus Time-Out to "0" (or variations on these settings).

Finally, you can install a patch that adjusts the PCI latency on some VIA-equipped motherboards. The patch, written by George Breese, is available at www.georgebreese.com/net/software.

We've also heard of people who were able to fix the problem by disabling ACPI in the BIOS.

Getting Rid of Gator

Is Gator's ad-ware driving you up the wall? Read this to learn how to eradicate one of the most annoying PC programs of all time.

I've been wondering what the GMT.exe file is. All I know is that it takes up a lot of my RAM.

—Shawn McCrea

Thanks to the Gator Corporation, your computer's been infested with ad-ware. You probably installed *Gator* unwittingly when you either installed an app from a site that uses Gator as a revenue source (*AudioGalaxy* being the most prominent), or browsed a web site with a *Gator* ad in *Internet Explorer*, where you were prompted to install an ActiveX control.

Once installed on your PC, the *Gator* program runs in the background, monitoring the sites you browse and delivering online advertising targeted to your tastes. These ads take two basic forms: pop-ups that appear in your browser when you visit sites containing a keyword, or banner ads that overlay the banner ads of legitimate web sites.

***Gator* is bad for several reasons. First, it collects and broadcasts everything about your web browsing habits, including all the sites you've visited, to the Gator Advertising network. Second, by overlaying a site's legitimate ads, *Gator* can display offensive or inappropriate ads, which can unfairly anger visitors to a site. Third, by overlaying a site's ads, the site loses the meager revenue it may make on the ads. Finally, no one likes pop-up ads. They're just plain annoying.**

By searching *Google*, we found quite a few pages dedicated to getting rid of *Gator*, and the methods vary depending on the version of *Gator* software that's installed on your system. First, you'll need to stop the GMT.exe process by right-clicking the Taskbar, clicking Task Manager, then going to the Processes tab, selecting gmt.exe, and clicking End Process. Once that's done, you can open MSConfig by pressing Windows key + R and typing msconfig, then pressing Enter. Go to the Startup tab, and uncheck the item named gmt.exe. If you find your PC infected again, you've got another piece of software installed on the system that installs *Gator*. We recommend spyware busters, such as *Ad-Aware* (www.lavasoftusa.com) or *Spybot* (http://security.kolla.de/), for keeping the riff-raff out.

October 2003

Sometimes Slower Is Faster

I have an Asus A7N8X v1.04 motherboard with the nForce2 chipset. The board supports DDR400, DDR333, and slower memory. I'm currently using DDR333 memory with an Athlon 2400+ XP processor. I'd like to know whether DDR400 memory will buy me any additional speed, or should I stick with DDR333? The main reason I'm asking is that I need to increase my memory from 512MB to 1GB in order to play Planetside (a co-worker told me that his lag went away when he increased his memory from 512MB to 1GB).

—Alex Buttery

Your buddy's right. Planetside needs huge amounts of RAM. (We've even run a couple systems with more than 1GB.) More memory helps keep the frame rates up in those massive 2,300 person battles.

We haven't tried nForce2 boards with older Model 8 Athlon XPs running on the 266MHz frontside bus, but in our experience, nForce2 systems that run RAM at the same speed as the CPU's frontside bus yield the best performance. Since your Athlon 2400 is a 266MHz processor, the Doc recommends that you try running the RAM you have now at both DDR266 and DDR333 speeds; if there's no noticeable difference in performance, there's no reason to buy DDR400 RAM for your current system.

This is by no means a universal rule. The VIA-based motherboards we've tested don't exhibit this behavior. Running your memory faster will make your system faster with a VIA board, even if the memory is running asynchronously.

Stop the Crackling Sound!

I have a Creative Audigy 2 Platinum running on an Asus P4B533 motherboard with a 3.06GHz Pentium 4 and 1GB of RAM. After installing the new P4 chip and turning on Hyper-Threading, I now get a crackling sound when the machine first boots. Also, when playing some games, my sound seems faster or out of sync with the video. When Hyper-Threading is off, my system works great. I'm using Windows XP Pro and have downloaded all the driver updates for the card and the motherboard. Creative tells me I should go back to the old CPU or turn off Hyper-Threading.

—Craig

Early drivers for the Audigy 2 had issues with Hyper-Threading and SMP systems. Generally, installing the latest drivers for your soundcard and mobo chipset, as well as flashing the motherboard's BIOS, will fix the problem. Creative recently released a set of WDM drivers that may also do the trick. If neither of these options works, try uninstalling the drivers, removing the card, then moving the card to another PCI slot. You may also try manually assigning an interrupt or IRQ to the card in the BIOS.

If nothing seems to fix the problems, you probably need to start afresh by wiping the OS and performing a new install to correct the problem.

> ***EARLY DRIVERS FOR THE AUDIGY 2 HAD ISSUES WITH HYPER-THREADING AND SMP SYSTEMS. GENERALLY, INSTALLING THE LATEST DRIVERS FOR YOUR SOUNDCARD AND MOBO CHIPSET, AS WELL AS FLASHING THE MOTHERBOARD'S BIOS, WILL FIX THE PROBLEM.***

Doctor's note: Small formfactor machines can get away with using smaller power supplies because an end user just can't cram that much hardware into one. See page 211.

My Brower Thinks Every Site Is Naughty!

My son turned on the Internet Content Advisor in *Internet Explorer*, and set a password that he doesn't remember. Now I can't go to any web sites at all; everything is "content protected." Can I turn this thing off, or do I need to reinstall windows?

—Sheri Smith

Lucky for you, Sheri, there's an easier way to disable the Content Advisor than reinstalling Windows, but you'll need to edit your Registry. First, close *Internet Explorer*, then click the Start Menu, then go to Run. Type Regedit in the space provided and press Enter. Then browse down to HKEY_LOCAL_MACHINE/Software/Microsoft/Windows/CurrentVersion/Policies/Ratings. Click the Key icon and press Delete. Close Regedit and restart *IE*. Go to the Tools menu, then click Internet Options and go to the Content tab. Click the Disable button, and you'll be prompted to enter a new password before you can turn off the Content Advisor. Enter a new password—so this won't happen again—and the Content Advisor will be disabled.

FYI: *Internet Explorer*'s Content Advisor denies a user access to any sites that don't bear a self-imposed content rating. The fact is that few web developers bother with these ratings, making *IE*'s optional feature virtually useless.

November 2003

Sometimes It Starts, Sometimes It Don't

I recently upgraded my CPU from an AMD XP 1900+ to a 2400+. It runs great at the proper speed, and the BIOS (upgraded as well, along with the chipset drivers) recognizes it for what it is. The trouble is, it doesn't always boot on the first attempt. Sometimes it does, but sometimes it takes a "reset" or two or three before it starts. The fans and the neon light come on, the disc drives flash, but the monitor is a blank screen.

—Michael Hall

There are a few places you should check. The first is your BIOS. Do you have the very latest BIOS rev available for your motherboard? You should also find out whether your board even supports the 2400+ proc. Although it might not seem like much to go from a 1900+ to 2400+, you are going from a CPU clock speed of 1.6GHz to 2GHz. That's a hefty clock-speed increase, and the latest BIOS is necessary to support the CPU. It's also possible that the increased requirements of the CPU are too much for your power supply, especially if your power supply is of questionable integrity.

CPU×Two?

I was told that if you have dual CPUs, you can dedicate certain processes to each CPU. I was wondering if this would work for Intel's Hyper-Threading technology. Can I set background processes to run on the virtual second CPU, and everything else to run on the primary CPU? Would this boost performance? This is a major factor for me in deciding whether to go Intel or AMD.

—Jason Catanzaro

A dual-proc or HT-enabled machine indeed makes it possible to dedicate the affinity for processes and applications via Windows XP's Task Manager. However, keep in mind that Hyper-Threading is not the same as two physical CPUs. The single CPU still has the resources of a single CPU. It's just a little more efficient at doling them out when in HT mode. If you, for example, run two applications that both require the same functions of the CPU, the performance will be no better, and may even be worse, if the applications are not optimized for Hyper-Threading technology. On the other hand, if you run multiple applications that use different functions of the CPU, you can see quite an efficiency boost. HT isn't the magic bullet of computing, but it does work very well at some things.

Short Speaker Wires

I bought the Logitech Z560 speakers about a year ago, but I've never been able to get the rear speakers to the back wall of my computer room. The rear speakers are attached with puny 6-foot speaker cables that are hard-wired to the speaker themselves—so I can't even buy more speaker cable to make it reach.

Is this problem endemic of all Logitech speakers? Can I save these speakers?

—Chris Papas

Dear Doctor: How do I lengthen the speaker wire in my Logitech Z560s?

Short speaker wires plague most companies' cheapo speakers, including Logitech's. More expensive speakers usually boast longer speaker wires with at least one standard end, so you can simply splice another section to your wire for easy lengthening.

If you can't extend the speaker wire at either the satellite and or the subwoofer end, your only option may be to cut the wire and splice in a new segment. You'll need a pair of wire snips, a spool of speaker wire that matches the gauge of the wire you're extending, and something to seal the ends together. We like to use shrink wrap, but electrical tape works fine too. First make sure you are able to distinguish between the two wires that make up the speaker cable. You don't want to accidentally switch the polarity when you attach the new speaker wires. Next, snip the cable and pull the two wires apart. Strip the last quarter-inch of shielding from each of the wires as shown here.

Before you go any further, position the shrink wrap on your cable. First, slide one piece of shrink wrap onto the end of the existing speaker cable, and another piece of shrink wrap over each individual piece of wire. Twist each of the two wires from the new cable segment onto its corresponding mate in the existing segment, making sure the polarity of each wire is matched.

Once the wires are twisted together, slide the individual pieces of shrink wrap over their splices, and apply heat with a hair dryer or heat gun until the plastic shrinks and forms a secure seal. Then slide the third piece of shrink wrap (the one you slipped over the end of the cable as a whole) over all the individual shrink-wrapped splices, and heat until it forms one cohesive unit. Repeat for each speaker wire you need to extend.

We recommend that you not cut and splice the cable of the speaker that houses the central pod. That cable often includes wires that control the power to the speaker system. A short on those wires could destroy your speakers or cause a fire.

AVI Files Won't Play

My problem is more about software than hardware. I'm trying to play .AVI files on my PC and all I get is the audio portion. The video screen remains black. I'm using XP Pro and the latest version of Windows Media Player.

—Mr. Krabb

The most likely cause of your problem is a bad codec. You are probably trying to play a video file that uses a codec that's not installed on your system. We've seen this when trying to play back video recorded using a proprietary video capture card, or when using an older version of the DivX codec. The only solution is to update the codecs on the system in question.

If you don't know what codec the video uses, you can easily find out by right-clicking it and choosing Properties. The codec should be listed in the Summary tab.

December 2003

Is My Router a Firewall Too?

I have just installed a Linksys four-port router connected to my cable modem. The Linksys router model BEFSR41 claims to act as a firewall of sorts. It includes the ability to block all anonymous Internet requests. How safe and functional is the integrated security of the Linksys router? Do I need to install separate firewall software such as *ZoneAlarm*?

—Dennis Jackson

Most home routers work by using network address translation (NAT), in which a single Internet address is shared among several computers on your home LAN. NAT is inherently secure, because it won't forward any unsolicited incoming packets from the Internet to your LAN. Some routers, including the model you mentioned, allow you to push all unsolicited incoming packets to one of your private internal IP addresses. This is great if you want to host a small web site at home, but it's a real problem when worms start blasting every device connected to the Internet. The solution is to either disable the IP forwarding or to set up a software firewall (like *ZoneAlarm*) on the machine that you forward incoming packets to.

Another problem is that the Linksys firewalls are now so ubiquitous that people are actually writing malicious programs that attack the routers. You can avoid an attack by keeping your router's firmware current. You could also set up a separate firewall between the router and the cable modem, but that's probably unnecessary.

Spyware Strikes Again!

I'm sick and tired of having to reset my Internet home page every day. I like it set to Yahoo because that's where my email address is, and *every day* the home page resets to a site called Global-Finder. I can't get it to stop doing this. I've scanned my hard drive for viruses, but to no avail. I've gotten so desperate as to even consider reformatting my hard drive. Please help me.

—Luis Tenorio

It appears your machine is infected with spyware. The ware in question is *CoolWWWSearch*—a small program that runs every time you boot your PC. Every time the program runs, it changes your home page and bookmarks, and creates pop-up ads for web sites that don't have pop-ups. We can see how it would be annoying.

The best way to rid yourself of *CoolWWWSearch* is to download a handy little utility called *CWShredder*. You can get it at www.spywareinfo.com/~merijn/files/cwshredder.zip.

Who's Boss, Serial or Parallel?

I recently read in your magazine that you can run Serial ATA hard drives and parallel ATA in a system. If you have one SATA drive and one parallel ATA drive on the primary master controller, who's the boss? On which one should I install the OS?

—Garth France

The Doc recommends that you install Windows and your frequently used apps on your fastest hard drive. Then install the stuff you don't use as often, like MP3 files, digital photos, and less-used games to your slower drive.

Now, don't confuse your drive's speed with its interface type. For the most part, Serial ATA drives are faster than parallel ATA drives; however, speed ultimately depends on the spindle speed of the drive and the size and type of disk cache.

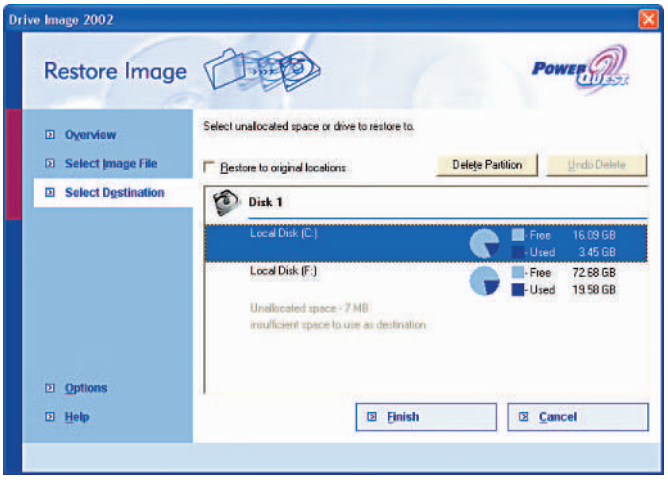
Your motherboard's BIOS should have a setting to control the boot order between the parallel and Serial controllers. Check your mobo's documentation for the full scoop on your particular board.

Imaging Drives for Everyone

I remember reading an interesting article explaining how you configure your test beds for benchmarking. It explained how you set up the hard drives so that the system could be restored to the "just installed" state without having to reinstall Windows every time. What program do I need to do that, and is there anything special I need to know?

—Steven Paustian

In the Lab, different editors use different products. Right now, PowerQuest *Drive Image*, Acronis *TrueImage*, and *Norton Ghost* are popular choices. Any of these products will take a snapshot of a partition on your drive and store it as an image file on another partition or drive. You can then dump the file back onto the original partition—or any other partition, for that matter—whenever you'd like to restore your drive to its original pristine condition.



Disk-imaging apps, such as *Drive Image*, let you capture a snapshot of a PC partition, which can be restored to your drive, or any other drive, whenever you want.

January 2004

My Browser's Gone Bonkers

I made the mistake of visiting Miramax.com to get some info about a DVD. Next thing I knew the browser—*Internet Explorer 6*—had opened up full screen. I resized it and clicked on a link, only to find it had once again gone full size. Now whenever I open a new browser it goes full screen.

This is extremely annoying. I've cleared my Internet temp files and web site history caches, but *IE* still opens full screen. I had things the way I wanted them, then a rude and presumptuous web designer decided his or her site was more important than anything else I had to look at and constantly rubs my nose in my mistake.

I've had this happen before with other sites, and I usually make a point of never visiting them again. Eventually *IE* resumes opening at the desired size, but how can I force it to do so more quickly? I'm sure I'm not the only person who's had to deal with this inconvenience.

—John C. Lind

The answer is easy if you know *Internet Explorer*'s little secret. You see, *IE* saves the window settings for the last window that closes, so all you have to do is close all your windows (including those in Windows Explorer) except for a single *IE* window. Then size that *IE* window the way you like it, and close it. The next time you restart *IE*, your window settings should be back to normal. If that doesn't work, just download *Mozilla Firebird* from www.mozilla.org. You won't be disappointed.

Serial ATA Power Poser

I'm running two Western Digital Raptor Serial ATA hard drives in a RAID 0 stripe. Is there any performance difference between using an adapter to utilize the serial power connection and using the standard four-pin Molex?

—Seth Dewberry

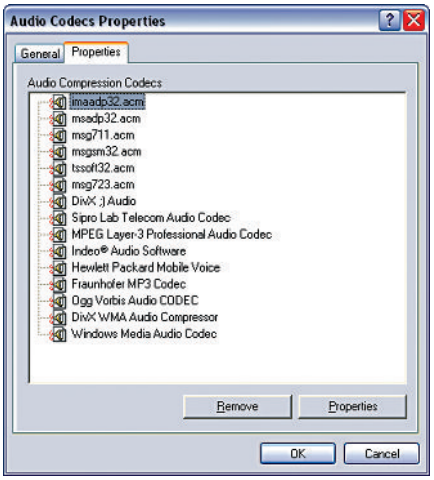
Using your Raptor's four-pin Molex connector won't hurt your RAID array's performance at all, but if you use the Molex connector instead of the Serial ATA power connector, you won't be able to unplug your drives while the machine is running. Of course, because you're running a RAID 0 striped array, you wouldn't be able to do that anyway.

Audio Aggravation

My PC's audio suddenly began to sound horribly distorted, but only in certain circumstances. For example, the audio in the introductory screens of games sounds like it's coming out of a garbage disposal, but the audio for the game itself is fine. I can play back DVDs without any problem, but downloaded trailers are unlistenable. I didn't install anything new. I don't think I've installed anything at all for a while. I'm using Windows XP.

My soundcard is a Creative Labs Audigy (the original, not the Audigy 2). I've tried adjusting the levels in my mixer, but the result is always the same. The volume lowers, but the distortion remains exactly the same. I'm going crazy trying to figure out what's wrong!

—Hiro Kikoshima



Device Manager allows you to prioritize, selectively disable, or adjust the settings for each of the audio codecs on your system.

Because DVD audio is fine and game audio doesn't come off sounding like Einstu[um]rzende Neubaten, the problem isn't with your hardware. With that possibility eliminated, we look to the fact that compressed video (such as introductory game video) and downloaded movies don't sound right. It sounds like you have a bad audio codec.

A codec (short for encoder/decoder) compresses audio and/or video so it will fit in a smaller space. Windows Media Video 9 is an example of a video codec, while MP3 is an example of an audio codec. These codecs can often be mixed and matched; so a video might use the popular maverick Xvid codec in combination with the MP3 codec for audio and an AC3 filter for Surround Sound. If one or more of these codecs becomes corrupted, you'll get poor sound, poor video, or no sound and video at all.

Here's how to root out the offender in Windows XP. Right-click My Computer, select Properties, click the Hardware tab, and then click Device Manager. Within Device Manager, click the plus sign next to "Sound, video, and game controllers," double-click "Audio Codecs," and select the Properties tab. You'll see all the codecs installed in your system. Starting from the top, double-click each codec, and you'll get a dialog box that allows you to disable the codec. Disable it, and test your sound with a file you know to trigger distortion. If that doesn't solve the problem, re-enable the codec, and target the next one in line. Keep going until you've pinpointed the culpable codec. Once you've disabled the bad codec, write down its name, and then try your test file again. Your sound may work fine. If your media player, however, says it can't find the right codec, enter the codec name in *Google* and find another source for a new or updated version of the same codec.

In the future, be especially wary of codec "packs" offered on the Web and USENET that promise to install current versions of all the codecs you need for media playback. The included codecs may be buggy, or worse yet, may even contain malicious code.

February 2004

Overclocking Gone Bad

I just bought an Asus A7N8X motherboard along with an Asus GeForce FX 5200 and an AMD Athlon XP 2200+. Originally, the bus was set to 100MHz with a multiplier of 13.5. Being power hungry, I decided to up the bus to 133MHz. Everything worked great! So I went for broke and cranked the bus to 200MHz.

That was when everything went wrong.

Now when I try to turn on the computer, the videocard gives me no output, and all I hear is a beep coming from my PC every few seconds. I've tried removing all the sticks of 256MB DDR PC3200 RAM save for one, yet that yielded no results. I also tried substituting the power supply from my old PC, but that didn't work either. What else can I try?

—Anton Nguyen

The bad news is that you may have fried your motherboard. We've heard reports of nForce2 motherboards being killed by overclocking. Hopefully you have a newer revision of the board with the latest BIOS, which would negate that risk.

Before giving up hope, try to boot the board while holding down the Insert key. On many boards, this will reset the BIOS after a bad overclock attempt. You can also try to reset the BIOS by throwing a jumper on the motherboard. If you can't find the jumper, just unplug the power supply, pull the CMOS battery, and wait five minutes. If that fails, detach the CPU fan and remove the CPU. Wait five minutes and replace it, then restart your computer.

If all of the above fails, you're probably going to have to buy a new motherboard. Remember, successful overclocking is all about baby steps. Jumping from 133MHz system bus to 200MHz system bus is too much too soon.

Athlon 64 Info, Please

I thought I knew all about the new AMD 64-bit chip that's coming out, but I'm confused. After some more research, it seems the chip is available in three forms. The Athlon 64 3200+ runs at 2.0GHz, sits in a Socket 754, rides a 1600MHz bus, and costs about $400. The Athlon 64 FX-51 runs at 2.2GHz, sits in a Socket 940, and costs about $750. The Opteron 146 runs at 2.0GHz, sits in a Socket 940, and costs about $700.

I was considering my next system build, but now I'm confused about the types of processors. I like the nForce3 board with the 940-pin socket but I'm wondering why the 754-pin socket processor is about half the price. All the articles I've read say the processors have the same basic features, so what's the difference between these chips?

—Ron Julio

Actually, the chips don't have exactly the same basic features. The big difference with the Athlon 64 3200+ is that it supports just a single-channel memory controller, and can accommodate nonregistered RAM. The Opteron and the Athlon 64 FX (which are kissing cousins) support dual-channel memory controllers and use only registered RAM. (Registered RAM runs slower but is generally preferred for servers and workstations.)

The difference between the Socket 940 Opteron 126 and the Socket 940 Athlon 64 FX-51 is the number of HyperTransport links. The Opteron has three HyperTransport links to support I/O options, while the FX has just one. The main difference between the Opteron 246 and 146 is cache coherency. AMD did not enable cache coherence in the Opteron 146 CPU, which is designed for single-processor workstation use. Plug two Opteron 146 CPUs into a dual board and it just won't work. Next year, AMD will introduce a new Socket 939 version of the Athlon FX, which will have dual-channel RAM support but will work with cheaper and faster nonregistered RAM.

The price difference between the CPUs is likely related to the number of layers on their respective motherboards. We suspect that the Socket 939 design will work with cheaper, four-layer motherboards. Similarly, Socket 754 boards are likely cheaper because they have fewer layers as well.

Windows (Security & Updates)
Most Popular Downloads
1. Mydoom (A, B) and Doomjuice (A, B) Worm Removal Tool (KB836528)
2. Security Update for Windows XP (KB823980)
3. Internet Explorer 6 Service Pack 1
4. Blaster Worm Removal Tool for Windows XP and Windows 2000 (KB833330)
5. Cumulative Security Update for Internet Explorer 6 Service Pack 1 (KB832894)
Next 45
6. Security Update for Windows XP: KB828028
7. Security Update for Windows 2000: KB828028
8. Security Update for Windows XP 64-Bit Edition (KB823980)
9. Security Update for Windows 2000 (KB823980)
10. Security Update for Windows XP (KB824146)
11. Cumulative Security Update for Internet Explorer 6 (KB832894)
12. Security Update for Microsoft Windows 98 and Windows 98 Second Edition (KB823559)
13. Windows XP Home Edition Utility: Setup Disks for Floppy Boot Install
14. Software Update Services 1.0 with Service Pack 1
15. Windows XP Professional with Service Pack 1 Utility: Setup Disks for Floppy Boot Install
16. Windows 2000 Service Pack 4 Network Install for IT Professionals
17. Security Update for Windows NT Workstation 4.0: KB828028
18. Cumulative Security Update for Internet Explorer 6 Service Pack 1 (KB824145)
19. Security Update for Microsoft Windows XP: KB828035
20. Internet Explorer 5.5 Service Pack 2 for Windows Me
21. Security Update for Windows NT Server 4.0: KB828028

If you find yourself frequently installing Windows on new machines, you can save yourself a lot of downloading hassle by keeping copies of all the Windows patches on a CD.

When Windows Dumps on You

How do I view .dmp files? I keep getting BSODs and I think the cause may be a bad driver. I'd like to pinpoint the culprit so I can update and replace the correct driver; since I've already updated all my drivers, I need to know which one I should roll back. I think the information I need is the C:\WINDOWS\Minidump.dmp file, but I can't analyze it.

—Rob Dutkiewicz

The easiest way to peek into a .dmp file is to right-click it, select Open With… and then scroll down to Notepad.exe. The .dmp file will open in *Notepad*, and you'll be able to mull through its contents. If nothing else, you should be able to figure out what application caused the crash, which could help you find the culprit.

THE BIG DIFFERENCE WITH THE ATHLON 64 3200+ IS THAT IT SUPPORTS JUST A SINGLE-CHANNEL MEMORY CONTROLLER, AND CAN ACCOMMODATE NONREGISTERED RAM. THE OPTERON AND THE ATHLON 64 FX (WHICH ARE KISSING COUSINS) SUPPORT DUAL-CHANNEL MEMORY CONTROLLERS AND USE ONLY REGISTERED RAM.

March 2004

Legacy App Woes

I have used a database program for years, but it won't work with Windows XP. It originally was a DOS program, and there is an updated version that works with Windows 98. I have tried to use the emulator in XP, but the app just won't run. How can I get a Windows 98 compatible program to work with Windows XP?

—Richard Fern

Like Kenny Rogers sings, you gotta know when to hold 'em, and know when to fold 'em…. The Doctor knows it's difficult to bid adieu to an application that's served you well for years, but, Richard, it's time.

The sad fact is that some applications work with the Windows XP compatibility tools, and some don't. We recommend you find a way to export your data from your old database app into a more commonly recognized format. Almost every application lets you import from comma- or tab-separated text files, so you should dump your old database into a .CSV (comma-separated value) file from a Windows 98 machine, then import it into your new database app.

My Tower Thinks It's a Desktop

I built a mid-tower PC with A7N8X Deluxe, 1GB of DDR PC2700, and an Athlon 2500+ Barton. I'm cooling the Athlon with a Xaser Volcano Fan. It worked like a champ for several weeks, then I left it running while I was away one afternoon and returned to find it with a blank screen and an audio message saying, "System failed CPU test." Power on/off produced the same results: no display on screen and the repeated audio warning.

Following the instructions I read on a support site, I set the case on its side and tried again. To my shock, it booted fine. I checked that the CPU fan and memory were snug, and they appeared to be. What else should I check? If this is a weight/mounting problem, what can I do about it?

—Terry Gowett

There are a couple things you should try. You may want to reseat the CPU in the socket and make sure you are using the correct shim for your CPU. Also, arm yourself with a good flashlight and make sure you have every single CPU jumper set correctly on the motherboard. You should also check all the power connections from your power supply to your mobo. Finally, make sure you have the latest BIOS for the board, and make sure you have a good quality power supply.

Clock Speed Conundrum

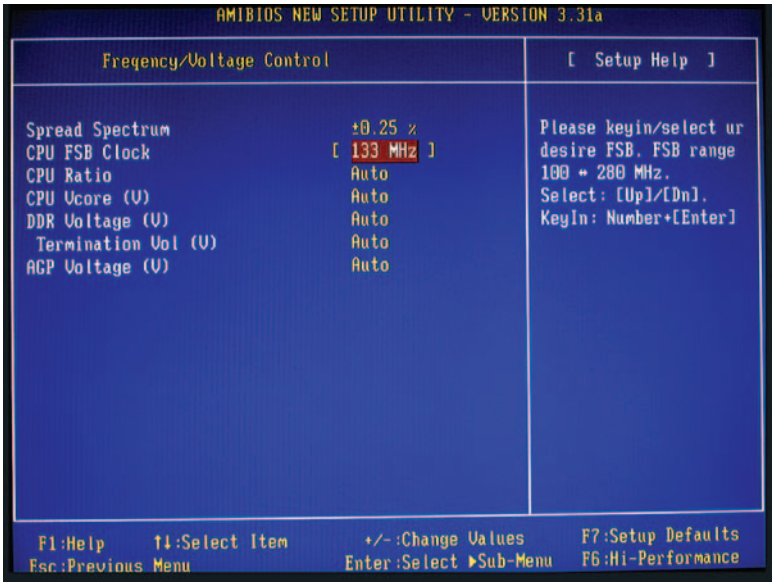
I have a P4 2GHz Northwood A. The PC runs OK, but when I look at the System Properties Control Panel, it says something confusing. At the top it says that I have a 2GHz chip, but right below that it says it's 1.95GHz. What's the story?

—Jesse Peterson

The likely culprit is a conservatively clocked motherboard. A 2GHz P4A is theoretically the result of a 100MHz frontside bus speed paired with a multiplier of 20. Not all motherboards will run the busses at exactly 100MHz, though. Intel motherboards, for example, tend to be conservative and generally run the frontside bus (as well as PCI and AGP busses) just under spec at, say, 99.5MHz. This errs toward reliability. Other board makers may actually clock it up higher at, say, 100.8MHz, which gives them more performance at the expense of reliability. It's also possible that your motherboard's clock is simply out of whack, leading to the lost of 50MHz. Another outside possibility is that you have a counterfeit Pentium 4, but that's a long shot.

Don't trust System Properties as it just doesn't provide enough information. Instead, download the excellent (and free) *CPU-Z* from www.cpuid.com and run it. If the FSB is reported as 98MHz, your board is either intentionally underclocked by the manufacturer, or someone manually set it to the incorrect speed. If it's higher, at, say, 124MHz, you're probably the victim of an unscrupulous vendor who overclocked a 1.6GHz Pentium 4 to 1,984MHz by cranking up the frontside bus speed.

If you're a little confused by *CPU-Z*, you can also download Intel's free *Frequency ID* utility (www.intel.com/support/processors/tools/frequencyid/). This utility will verify what CPU you have and whether it's overclocked or not. If it's simply a motherboard that's underclocking the CPU, you shouldn't worry—50MHz won't kill you. If it's overclocked, however, then scream bloody hell.


AMIBIOS NEW SETUP UTILITY - VERSION 3.31a
Freqency/Voltage Control
[Setup Help]
Spread Spectrum ±0.25 %
CPU FSB Clock [133 MHz]
CPU Ratio Auto
CPU Vcore (V) Auto
DDR Voltage (V) Auto
Termination Vol (V) Auto
AGP Voltage (V) Auto
Please keyin/select ur desire FSB. FSB range 100 ~ 280 MHz.
Select: [Up]/[Dn].
KeyIn: Number+[Enter]
F1:Help ↑↓:Select Item +/-:Change Values F7:Setup Defaults
Esc:Previous Menu Enter:Select ▸Sub-Menu F6:Hi-Performance

If your CPU's clock speed is off, you can check the BIOS to see if your frontside bus speed is correct.

April 2004

Do Small Formfactor Machines Have Enough Juice?

I have a question regarding the power supplies that come in small formfactor (SFF) machines. These days, most people recommend a 400 or 450-Watt power supply for a gaming PC. How is it that most SFF PC's come with a 200 to 250-Watt but are still considered adequate to power a top of the line processor and video card?

—Mark

The reason SFF makers can use "just 200-Watt" power supplies is that they know you can't overload them. In most SFF boxes, you can run one hard drive, one AGP video card, one PCI card, one 3.5-inch floppy drive, and one optical drive. In memory, you're usually also limited to just two slots in most cases. On the other hand, in a full-blown gaming PC, you can have as many hard drives as you want, an AGP card, two or three optical drives, four pieces of RAM, and four or five PCI cards which can each suck down 25-Watts of power. Some may even have more than one processor machines, which, of course, sucks down even more power. The 400-Watt recommendation is because vendors don't know what you'll add to the system. Also keep in mind that we always stress quality over quantity. A high-quality power supply at 350-Watts can actually produce cleaner and more stable power then some no-name power supplies that claim to have 475-Watts or more.

You Used What Where?!?

I recently built a wicked system but was experiencing random shutdowns, so I checked and found that I'd forgotten to apply thermal paste between the processor and the heatsink. My problem is there aren't any local stores that carry thermal paste where I live. My father has a ton of welding equipment and since I was desperate, I used soldering paste instead and it solved the problem! My computer now runs fine and I no longer experience the random shutdowns.

I'm wondering if I can continue with things the way they are or if I should order some thermal paste through the mail and reseat my CPU and heatsink.

—Lana

Generally, if it's working, you probably don't want to mess with it. However, soldering paste may not be the best solution because it may be electrically conductive. Most of the higher-quality thermal pastes have very low electrical conductivity, but high thermal conductivity. Depending on the solder paste you're using, it's likely to be electrically conductive. If the paste were to ooze out of the socket and onto the motherboard, you could short something out.

You shouldn't have a problem, unless you applied way too much of the stuff. If enough oozes out onto the surface of an Athlon XP, you could also short the bridges out and cause odd things to occur. The Doctor recommends that you get a tube of real thermal paste. You can order it online from most any store, such as highspeedpc.com for under $10.

Formatting USB Keys

I just purchased a PNY Attache 128MB USB 2.0 key drive. I saw that I can format it and that there are two different choices: FAT16 and FAT32. What would happen if you formatted a USB drive?

I also noticed that the drive is currently formatted to FAT. Would there be any speed or storage advantages to reformatting it in FAT32? And why is NTFS not an option?

—Ian J Ginsberg

Just like when you format a normal hard drive, the formatting process will erase all the data stored on your USB drive, but it won't do any permanent harm to the drive.

There's really no difference between FAT32 and FAT16 as far as your USB drive is concerned. FAT16 has better compatibility, but the two versions of Windows—Windows 95 and Windows NT 4—that don't speak FAT32 also don't have USB support. Formatting with FAT32 may also limit your disk's Mac compatibility. NTFS simply isn't an option because Microsoft doesn't allow a removable device to be formatted using NTFS.

Is My Headphone Jack Vestigial?

I can never seem to get the headphone jacks to work on my CD/DVD-ROM drives. Does something have to be enabled to get them to work? Is there a cable that I need to split to run to the audio on the back of my computer and then back to the CD-ROM drive? Why would they put a jack on the front of my drive if it doesn't do anything? Are they just screwing with my mind?

Having trouble getting the headphone jack on your PC working? Read on for the answer!

—Josh Ribble

The headphone jack is a vestigial organ from the Windows 3.1 days, when most people weren't blessed with soundcards. But optical drives did have inexpensive, built-in digital-to-analog converters that could take the digital signal from a CD, convert it to an analog signal, and send the output to your headphone jack. Suddenly, you had an instant CD player. Very cool.

But as you've noticed, the headphone jack doesn't do much these days. In fact, you won't even get any sound from it with most system configurations. That's because your soundcard and operating system have teamed up to create a digital, as opposed to analog, path from your audio CD all the way to your speakers. If you want to listen with headphones, use the line-out jack on your soundcard. If you don't have a breakout box that brings the line-out to an accessible spot, you can buy a headphone extension cord from Radio Shack for peanuts instead.

If you're determined to use your optical drive's headphone jack, it's still possible—you just have to get your analog signal back. In XP, right-click My Computer, select Properties, and click Device Manager. On the device list, click the + sign next to DVD/CD-ROM drives, and right-click the drive you want to plug your headphones into. Select Properties from the menu, then click the Properties tab. Uncheck "Enable digital CD audio for this CD-ROM device." Your headphone jack should now work.

If you want to be able to play the audio through your PC speakers and headphones interchangeably without having to dig up this checkbox, you'll need to connect the analog-out from your optical drive to the analog-in on your soundcard using a special two-pin cable that should have come with your drive. Check your drive's documentation to find the analog-out on the back of the device.

May 2004

Mouse Hunt

I've been experiencing some issues with my mouse lately. Whenever I'm working on my computer, my mouse cursor will decide to run off on its own, usually to the top corners of my desktop. During a game, my character will randomly spin around in circles and I end up shooting at my own feet. I've tried different mice, all of my USB and PS2 ports, and nothing. Thing is, I don't experience this problem when I use a joystick.

—Lynn Roberts

The Doctor had this exact same perplexing problem when he first started playing *Battlefield: 1942*. The solution is simple: Try unplugging your joystick while you're playing games that don't require it. Odds are that something is knocking the joystick off-axis and causing your uncontrollable spin.

Label This 'Answered'

I read an article online recently that stated that marking the label side of CDs and DVDs with Sharpie markers could eventually damage the disc because the ink would eat through the label layer and damage the data layer. Is there any truth to this? What should I use to label my optical media?

—TheRealDeal

If you were to ask a chemist (the Doctor knows a few), she'd probably tell you that you ought to use oil-based markers, because alcohol based ones (like classic Sharpie permanent ink pens) might dissolve over time the lacquer coating of the disc surface, thus changing its reflectivity and ruining the disc.

That said, we've used alcohol-based Sharpie pens ever since we got our first wind-up CD burner, and not a single editor has ever had a problem with a disc that he or she would be willing to attribute to ink damage. If you're really worried about the longevity of a disc, stick with pens that are oil based or clearly marked for optical disc use (and stay away from adhesive disc labelers; even a slightly misaligned label can ruin a disc). But paying a premium for special CD markers reminds us of a time when we nervously paid eight bucks for "Cassette Head Cleaner," when rubbing alcohol—more likely than not the sole ingredient—went for about one dollar for 16 ounces at our local drugstore.

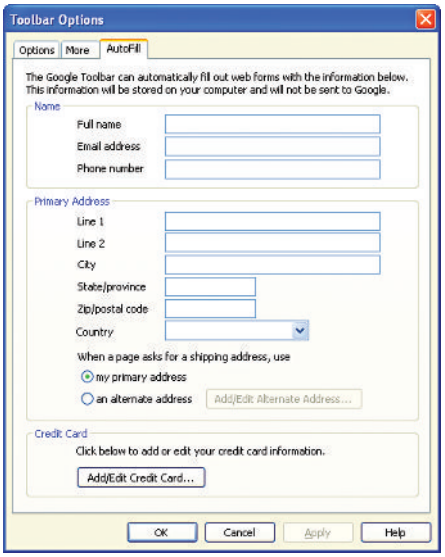
How Safe Is the AutoFill Feature of Google's Toolbar?

How safe is the auto-fill in feature of the Google Toolbar? Is there any possibility of hackers getting a hold of my personal information if I use this feature?

—Benjamin Villegas

It's as safe as any other information stored on your computer or in any other kind of auto-fill software, including the software that's built into *Internet Explorer*. By personal information, we can only assume you mean your credit card numbers. If anyone you don't trust has access to your PC, or the PC is in an insecure location, you shouldn't use AutoFill for credit card info.

As a general rule, we find that AutoFill is an annoyance, especially if you have more than one address that you use on a regular basis. Taking an extra three seconds to type your information into a page that needs it is much better than finding out that your new PC upgrade accidentally was sent to your old office because your form auto-filler put in the wrong address.



The Google auto-fill feature is safer than most, but the Doctor really doesn't see the point of using any form auto-filling software.

Saving Patches and Hotfixes for Later

I have a question about patches and hotfixes. I thought I could download all the patches to a directory and apply them when I wanted, but they always install themselves and I have no idea of how to save them so that I can at some future date wipe my hard drive and reinstall Windows and then reinstall all the fixes without having to download them again. Is this possible and if so how?

—Joe Zinskie

The site you want is download.microsoft.com, and click on the Windows (security and updates) option on the left side of the page. Make sure you download all the updates listed—you'll need to click the "Next 45" link to see them all.

Variable Vs. Constant Bit Rate MP3s

I'm looking to rip my entire CD collection so that I can use my PC to listen to several hours of music without having to swap CDs. And I'd like to be able to transfer a selection of songs to an MP3 player for listening to while on the go. I've heard that ripping using a variable bit rate offers the best quality but that ripping using a constant bit rate ensures the best compatibility with MP3 players. Is that still true of today's newer MP3 players? I'd be looking to buy either an Apple iPod or a Creative Labs MuVo NX.

—Marc Waugh

You heard correctly. *Bit rate* refers to the amount of information recorded for every second of audio. The higher the bit rate, the closer the sound will be to the source audio. Constant bit rate (CBR) recording records the same amount of information throughout the entire song, be it 128Kbps, 160Kbps, or higher. Variable bit rate recording, on the other hand, throttles up the bit rate during complicated bits (loud, distorted guitars, orchestras, that kind of thing) and lowers it during less complicated passages (like silence, for example). The purpose of variable bit rate encoding is to reduce the size of an audio file as much as possible and still maintain good audio fidelity.

We strongly recommend variable bit rate recording. But you're right to be cautious about VBR support in portable players. For example, Apple's iPod supports VBR encoded MP3s, but Creative Labs MuVo NX does not.

June 2004

Watching Live TV Via Wi-Fi

I recently created a Wi-Fi network and I want to know how I can use it to watch television off a Media Center PC, in real-time, on another computer on the network. Specifically, I want to watch a TV show (not already recorded) on a Tablet PC in another room. Everyone agrees that Windows XP Pro should be able to do this, but no one knows how to accomplish it. Watching recorded shows, playing MP3 files, and sharing items from the hard drive is no problem by the way.

—Neil G. Powell

That's exactly the kind of feature Windows Media Center PCs need, but as far as the Doctor can tell, there's no way to enable it with this build of the OS.

We've had great luck in the past using *Beyond TV 3* (the software formerly known as *SnapStream*). Using the app on a normal TV via a tuner card, you can stream live or recorded TV programs to a wide variety of devices, from laptops and set-top boxes to Pocket PCs. A demo is available at www.snapstream.com.

Putting Windows Folders Under Lock and Key

Is there a way to securely lock an individual folder in Windows XP? I want to be sure the contents are password protected, secured against a virus attack, and safe from being deleted without the password. Do you know of such a software solution? I have seen several that offer this, but I wanted to consult you first. I was told that Win XP has a way to password protect folders through compression, but this won't solve the issue of deletion, etc. Can you help?

—Corbin Grimes

With Windows XP Professional, it's easy to lock down entire drives, folders, or even single files using nothing more complex than the built-in security settings. Beware though; if you mess up your settings, it's possible to completely lock yourself out of a directory.

First, open My Computer and go to the Tool menu. Go down to Folder Options, then click the View tab. Scroll all the way to the bottom and uncheck "Use simple file sharing (Recommended)." Click OK and then browse to the folder you want to lock.

Right-click the folder and select Properties. Click the Security tab and then the Advanced button. Uncheck the box for "Inherit from parent the permission entries…." Doing that will prevent permissions of the parent folder from being applied to the folder you want to protect. Now click the Add button and type in the name of the user account that will have access to your directory. Click the Full Control box in the Allow column on the next screen. Then click OK and remove all the accounts from the Permissions tab except the account you just added *and* the Creator Owner and System accounts. Then go to the Owner tab, and change the name to the account that should have access.

You can also select Deny in a folder's Permissions to prevent specified users from having access to a folder, but there's a catch. If a user belongs to more than one group and one group is allowed Full Control over a folder, but the other group is denied access, the Deny rule will take precedence. Furthermore, if you incorrectly apply Deny to important system folders, it's easy to render your system unbootable.

Once you have the permissions set properly, you should also encrypt your files. The Windows security settings protect your files only from people who are actually logged on to your computer. If they put your hard drive into another system that reads NTFS, your files are accessible. You can toggle encryption in the Advanced button on the Properties page of the files or folder you want protected.

Playing It by Ear

I recently backed up all my CDs using the MP3 file format at the maximum-quality, variable-bitrate setting. The music sounded fine, but for comparison I also copied the CDs using the WMA file format at the lossless, variable-bitrate setting, and to my surprise, the WMAs sounded far better and were ripped a lot quicker than the MP3s. Am I doing something wrong? I thought MP3s encoded at a high setting (e.g., 320Kbps or higher) offered superior sound to anything WMA could offer. I noticed that the WMA files were recorded at bitrates up to 800Kbps, but I thought the human ear was incapable of discerning quality differences beyond 320Kbps?

—Marc Waugh

A person's ability to discern differences between the two archival methods you describe depends on the quality of the speakers and the acuity of one's hearing.

Remember that MP3 is a "lossy" compression format. It reduces audio files sizes by eliminating the audio data least likely to be heard by the listener. The heavier the compression, the more the compressor is going to have to slice away audio data, eventually degrading the signal audibly.

***Windows Media Player 9's* audio codec, on the other hand, is a "lossless" compression format. No data is discarded from the original file; instead, audio data is compressed in a way similar to Zip files. So instead of doing something wrong, you actually did something *right*. By archiving your music using a lossless compressor, you were able to reduce the size of the files to almost half their uncompressed size, while leaving the quality of the original CD intact. You can later recompress any or all your tracks into MP3s for your portable player without having to worry about the horrible artifacts introduced by compressing an already compressed signal (as you would by re-encoding your MP3s at lower bit rates).**

There are several other lossless compressors available that you might want to try. FLAC (flac.sourceforge.net) and APE (www.monkeysaudio.com) are both lossless and should produce perfect reproductions of your CDs. There are also a bevy of applications available that will convert both formats to more popular lossy compressed formats, like MP3 or AAC for listening on a portable player.

> ***WITH WINDOWS XP PROFESSIONAL, IT'S EASY TO LOCK DOWN ENTIRE DRIVES, FOLDERS, OR EVEN SINGLE FILES USING NOTHING MORE COMPLEX THAN THE BUILT-IN SECURITY SETTINGS. BEWARE THOUGH; IF YOU MESS UP YOUR SETTINGS, IT'S POSSIBLE TO COMPLETELY LOCK YOURSELF OUT OF A DIRECTORY.***

Chapter Seventeen

The Watchdog

When companies do wrong, Maximum PC's consumer advocate goes after them.

Pictured here: The Watchdog. Well, one of them. Each month, the real Watchdog chooses the reader submission that most resembles his temperament. Not surprisingly, the chosen dog is pretty tough-looking.

Unless you're extremely lucky, you've probably wondered if you were being ripped off at several points in your life. Even for the extremely vigilant, it happens.

Unfortunately, this is especially the case with regard to purchasing computer parts and equipment. Hundreds of computer and computer part manufacturers go out of business. This doesn't just happen to the mom-and-pop variety of company, either. Small-, medium-, and large-sized business go out of business all the time, too.

Take, for example, 3Dfx. As described in Chapter 7, "Videocards," the 3D card manufacturer went from number one to bankruptcy in just a few years.

> ***WHEN COMPANIES GO BANKRUPT AND OUT OF BUSINESS, IT LEAVES OWNERS OF THAT COMPANY'S PRODUCTS IN A REAL LURCH.***

When companies go bankrupt and out of business, it leaves owners of that company's products in a real lurch. If that product malfunctions or a user has any other need for technical or other product-related support, it will be harder to find than a Ben Affleck–Jennifer Lopez hit.

Honest—and Strong-minded

This isn't to say the only way we can feel ripped off is when companies go belly-up.

How many times have you bought a product, taken it home, and watched it fail immediately or work in a less-than-as-advertised kind of way? Now—and be honest—how many times have you actually complained to the company, tried to return/exchange the product, or filed a complaint of some sort? Was your answer "100%"? Yeah, we didn't think so.

Don't feel bad—sometimes you have to cut your losses; with some companies and retail outlets, the pain and time degree of involvement can often outweigh the cost in time and money spent attempting to rectify the problem.

Regular readers of *Maximum PC* already know this, but there's a consumer advocate in the PC purchasing space who will fight for your rights. A hero who will call misbehaving or unethical resellers of PC parts and products to the mat. An honest, no bull reporter who makes the tough phone calls and asks the difficult questions for one reason: He can't stand it when people get ripped off.

Maximum PC's Watchdog is the only dedicated PC consumer advocate. That's impressive when you consider how many PC enthusiast web sites and magazines exist. The Watchdog's tenacious, no-holds-barred attitude is part and parcel of our magazine's no-bull approach. It's also extremely important in the high-end categories of PC enthusiasm, because in their unbridled optimism in emerging technologies, early adopters and limit-pushers get burned more often than anyone.

But whether you're an existing reader of *Maximum PC* or you're new to our ethos, you're going to find the following pages of this chapter extremely interesting. Why? Because we're about to take a walk down memory lane, through the Watchdog's best stories of the year. You'll probably find yourself nodding in acknowledgement as you read about products you've experienced problems with.

And then there's the fact that the Watchdog can be, well, fairly gruff and surly when going after egregious transgressors.

We've organized the chapter in such a way that you'll be reading the best Watchdogs of each issue of the last year. Enjoy!

And one final note: If you feel like you've been ripped off or spiked by a fly-by-night operation, sic the Dog on them by writing to **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

WatchDog

Maximum PC takes a bite out of bad gear

July 2003

Lifetime Receipt

Dear Dog: I purchased a GEForce4 Ti 4600 graphics card about a year ago. When I went to start my PC, it had no display and the PC beeped one long beep and three short beeps, which indicates a display error. My first instinct was to try my old AGP card, a GeForce3 Ti 500, which worked just fine. I then took the GeForce4 and put it in a different computer. That machine refused to POST. When I contacted PNY, it refused to offer any type of warranty support without a receipt. Well, on the front of the box, it says "life-time replacement warranty," not "life-time replacement warranty with a receipt."

—Shelley Trosin

The Dog Responds: The Dog contacted a spokesperson for PNY who said the warranty covers only consumers with receipts. The spokesperson went on to quote the company's warranty policy posted on PNY's web sites: "…Warranty coverage requires proof of purchased documentation evidencing the date of purchase (sales receipt or invoice)." D'oh!

The warranty also notes: "Lifetime is defined as the lifetime of the product on the market. Outdated technology is not covered by lifetime warranty as the item is no longer available on the common market as a new product."

Since initially writing to the Dog, Shelley said she found her receipt and was in the process of RMA'ing the board with PNY. There are two valuable lessons here. First, don't lose your receipt. It's generally the only proof that you actually purchased the product. Some companies do honor credit statements that show the purchase, but an original receipt is the gold standard. If you are required to send in the receipt to obtain a rebate, make sure you have a copy of the receipt for your records. A reliable receipt technique is to designate one box, say the box your videocard came in, as your "tech receipt box."

The other lesson here is that a company gets to define what it means by "lifetime." While lifetime may mean human life to you, most companies mean lifetime in technology years, which is accelerated by a 10-to-1 or 100-to-1 ratio. Just don't be swayed by "lifetime" warranty promises without first reading the fine print.

Game Voice Gone Mute?

Dear Dog: My friends and I have been playing games online since broadband made it to our area. We all bought Microsoft's *Game Voice* console to meet online. For a while it worked great, but recently we have noticed some strange problems. First, sometimes we are unable to connect to each other's chat sessions or to public servers. If you uninstall and reinstall the software then it will sometimes let you connect. Second, Microsoft uses Windows *Messenger* to populate the *Game Voice* list of users. The newest version of *Messenger*, called M*SN Messenger 5.0*, doesn't work with the *Game Voice*. Microsoft's solution is to install *Messenger 4.6*. Third, we are seeing several people with DirectX 9 issues. Some say they can't even install the *Game Voice* software if they have DX9 installed. So, what gives? Is Microsoft no longer supporting *Game Voice*? It has been more than a year since any software for it has been released.

—Matt Fagala

The Dog Responds: The Dog contacted Microsoft to see if the company could make a prediction on the life of *Game Voice*. After giving the company more than two months to respond, the Dog was still waiting for Microsoft to make up its mind. That kind of deafening response suggests to the Dog that *Game Voice* is headed for Davey Jones's Locker. Arrr. So until Microsoft can confirm that it will support *Game Voice*, you're advised to avoid purchasing it. Woof.

Five Questions with the Watchdog

Cloaked in anonymity, each month, the Watchdog selects the most ferocious-looking Watchdog from a batch of reader submissions.

Who is the Watchdog, you ask? We keep that a secret—if his name were to leak out, it might make life troublesome, or at least terribly annoying. But we can tell you this: He's been on the job for years, and, as many a company will verify, his bark and his bite hurt equally.

Here's more insight into one of the world's greatest advocates.

Q: How long have you been writing the Watchdog for *Maximum PC*?

The Dog: My first column appeared in the September 1998 issue of *Maximum PC*. That was the first issue after the magazine changed its name from *Boot*. Prior to that, I was writing the column for a magazine called *Home PC*. When it and *Maximum PC* merged, the *Maximum PC* staff begged me to stay. I accepted.

Q: How do you select the emails that you answer?

The Dog: Because I get 20 to 40 emails per day I generally try to identify any consistent patterns of problems with companies. They quickly float to the top. But I also pay attention to recalls, bankruptcies, lawsuits, and other items that will affect lots of people. After that, it's cases that appear especially egregious or unique cases that are worth checking out.

Q: What are some of your favorite Watchdog columns?

The Dog: Early problems with Kenwood's wonderfully fast but horribly unreliable True-X 40x40 optical drive come to mind, as do any and all columns that concluded with happy endings. In Kenwood's case, the company was sued and agreed to replace all of the 40x40 drives with 72x drives. I'm also proud of my IBM Deskstar coverage—I was one of the only consumer advocates to dig into the files when they became unsealed.

Q: What kind of resources do you use when you're investigating a company?

The Dog: The Dog uses a combination of public information and public records databases. I also rely on the standard consumer agencies such as the Better Business Bureau for data, as well as Dun and Bradstreet. Not surprisingly, the Internet is an incredibly valuable tool for researching a company's background.

Q: What's the most egregious example of consumer exploitation you can remember?

The Dog: IBM's famous "Death Star" certainly comes to mind as a hot topic. And unlike other companies that have stepped up to recall or admit there were problems, IBM has dug in its heels and continues to insist that there is absolutely nothing wrong with the drives.

WatchDog

Maximum PC takes a bite out of bad gear

Jumbo Buffer or Just Extra-Large?

Dear Dog: I recently purchased four Western Digital WD1200JBs based on *Maximum PC*'s great reviews. I'm the curious type and decided to take the PCB off the hard drive in order to look at the circuitry. I noticed it used Samsung memory for the 8MB cache. I searched for the chips on Samsung's web site to find some info about them (speed information mainly). To my surprise they show up as 4MB chips! Am I going nuts or is Western Digital trying to pull a fast one (or should I say a slow one)?

—Gabriel Finney

The Dog Responds: The Dog didn't think Western Digital would substitute a 4MB part for an 8MB part, but the matter deserved investigating. Western Digital officials told the Dog: "Since the memory we use is either 1Meg x 16 = 2 MB, or 4Meg x 16 = 8 MB, and a Word (16 bits) is 2 Bytes, the reader may have confused the 4M as 4 MB, but it is really 4 MegaWords which = 8 MegaBytes."

In other words, rest assured that those popular jumbo-buffer drives indeed have 8MB caches.

Bouncing Rebate Checks

Dear Dog: We recently received a rebate check from Universal Buslink that bounced—the account was closed. The company will not make good on the check, which cost us money for a returned deposit.

I have copies of the check, stamped account closed, a letter from the bank, etc. I have faxed copies to the company several times, but I never hear back from them, and when I call about it, they ask me to fax the info again.

—Jennifer Schwarz

The Dog Responds: The Dog spoke with an official at Universal Buslink who said that Jennifer likely waited too long to cash the rebate check. When rebates are offered, accounts are created from which to disburse monies. After the rebate period has passed—say, 60 days from when the last rebate check is issued—the account is closed. Depositing a check after the period would result in a bounced check. Jennifer told the Dog, however, that she deposited the check as soon as she received it, and is sure it was deposited within the 60 day limit. Buslink admitted to the possibility of a glitch, and plans to reissue a check and address the bank fees if they are reasonable.

> ***THE COMPANY WILL NOT MAKE GOOD ON THE CHECK, WHICH COST US MONEY FOR A RETURNED DEPOSIT.***

Sony Digicam Update

If you're an owner of Sony's Cyber-shot DSC-P1 digital camera and have experienced inconsistent battery life, listen up!

Sony says some Cyber-shot DSC-P1 digital cameras may exhibit inconsistent battery life due to corrosion on the connector to the AC charger. Sony says the users should try to keep the area dry when using the camera in "extreme weather environments." Sony says that if your DSC-P1 is exhibiting inconsistent battery life, the company offers a free diagnosis. If Sony determines that it's warranted, it may apply "no-charge" improvement to the camera, AC adapter (AC-LS1A), and/or battery (NP-FS11). The free improvement is being offered until April 2004. After this date, you'll have to pay for the repairs yourself. To have your camera diagnosed, you must ship it, the AC adapter, and the battery at your expense to Sony's Service Center in Irvine, California. You may contact Sony at 800.222.7669.

WatchDog

September 2003

Maximum PC takes a bite out of bad gear

Look Before You Leave

The Dog has said it before, but is saying it again: You might want to check the product box before you leave the store. From DVD boxes devoid of DVDs to videocards that aren't what the package indicates, there seems to be a rash of consumers getting burned these days.

In one extreme case, a reader purchased what he thought was an ATI videocard, but once home, he discovered an ancient nVidia card inside the shrink-wrapped package. Human error notwithstanding, the Dog is certain ATI would *never* put an nVidia videocard in one of its boxes. So how does the wrong card end up in a shrink-wrapped box? It's likely the work of an unscrupulous customer who swapped the cards out and shrink-wrapped the box. Sadly, the only way to prevent this from happening to you may be to open the box either in the store or once back at your car. Some vendors, such as VisionTek and AMD, now use clear plastic packaging so you can actually see the components while you're in the store.

BestBuy.Com Spam Scam

If you receive an email claiming you've been a victim of credit card fraud, think twice before responding.

Clever scammers have taken fraud to a new level with a tactic that combines spam with scam. An unknown number of people worldwide received a spam message this summer claiming they had been victims of credit card fraud at BestBuy.com's web site. The email directs the person to BestBuy.com's "fraud alert" web site for more information. The link in the email, however, doesn't take the person to BestBuy.com, but rather to a web site expertly disguised as BestBuy.com. Once there the person is asked to enter his or her credit card number, social security number, mother's maiden name, and even ATM pin numbers.

While email spam scams aren't new, FBI Agent Paul McCabe told the Dog, this one is in a class of its own.

"The difference in this one is how elaborate it was," McCabe said. Even the most scrupulous person would've probably been fooled by the look and feel of the site. Clicking the BestBuy.com logo on the fake page, for example, would take the person to the real BestBuy.com, which helps support the illusion that the customer is actually at the official BestBuy.com web page.

How many people fell for the trick? The total is unknown, but Agent McCabe said the FBI's Internet Fraud site (www.ifccfbi.gov) received at least a few hundred complaints. Not all were victimized, but complaints came from all over the U.S. as well as overseas. In this case, McCabe said, Best Buy helped mitigate the harm.

"The damage could have been a lot worse if Best Buy didn't respond so fast," McCabe said. Upon learning of the scam, Best Buy posted a pop-up to warn its customers of the scam and immediately contacted the ISPs where the bogus pages were posted to have them removed. Exactly how did the scoundrels recover the data? McCabe wouldn't elaborate on specific details because of the ongoing investigation, but he did say the information was captured as victims filled out each page. McCabe said victims should immediately contact their credit card company and also keep tabs on their credit history for the next few years. It's not known whether the scammers will use the information for identity theft or credit card fraud. Victims should also file a complaint at the Internet Fraud Complaint Center (www.ifccfbi.gov) or with their local FBI office.

Of course, the larger issue is that scam artists are increasingly using sophisticated social hacks to fleece people of confidential information. eBay.com was itself the victim of a similar scam scenario. And it's not hard to imagine a web page masquerading as, say, PayPal, where you'd unquestioningly enter your account name and password. With scammers casting ever-wider nets, consumers need to be hyper-vigilant about divulging confidential information.

Music(Mis)Match

Dear Dog: Several years ago I purchased online the lifetime updates key for *MusicMatch Jukebox Plus*. On several occasions I've had to uninstall and reinstall the program due to typical PC difficulties, but the key always remained available. Recently, I had to reinstall Windows 98, and this time the key was lost. Over the last three weeks, I've attempted to contact MusicMatch via the various means posted on its web site, with no response. (Of course, there isn't a phone number to reach an actual person.) I constantly hear great things about this company, but this is definitely making me consider a new program.

—Chuck Bortscheller

The Dog Responds: The Dog contacted a MusicMatch official who had the company reissue Chuck's key. The Dog also learned that MusicMatch recently discovered that some people who had paid for "Lifetime Free Upgrades" were incorrectly issued single-version keys, meaning the keys would not function beyond the original version. MusicMatch has since reactivated those keys so they will work on newer versions of the program. Woof.

WatchDog

Maximum PC takes a bite out of bad gear

October 2003

Rebate? What Rebate?

Nearly five years after consumers sued Newcom and retailers of its products over unpaid rebates, the companies involved have finally settled. As the Dog wrote in the August 1999 column, "It isn't a question of who didn't receive a rebate check—it's a question of who did."

Accounts of the figure differ, but it's estimated that some 250,000 to 300,000 people should have been paid rebates but weren't. When Newcom shut down its operation in 1999, attorneys turned their attention to the stores that sold Newcom's modems, videocards, and other accessories, claiming that the stores knowingly misled consumers into believing the rebates were still valid when Newcom had a history of not honoring them. At this time, retailer Staples told the Dog that the suit was misguided because the store knew Newcom had a poor rebate history and thus was paying customers' rebates out of its own pocket. "Staples is the good guy in this," an official said at the time.

The settlement proposal didn't admit any fault on the part of Newcom, Best Buy, Circuit City, CompUSA, or other retailers that sold Newcom products with rebates. The proposal is unlikely to get too many smiles from consumers. Consumers who were owed a rebate of less than $30 will receive a $10 discount off purchases exceeding $200 from the affiliated retailers. People owed more than $30 from Newcom will receive $20 off a purchase exceeding $400 from the retailers. To qualify, consumers must submit claim cards before the October 26, 2003 deadline. Claim cards and additional information about the settlement can be found at www.rebatesettlement.com.

Attorneys who filed the original suit said they understand if consumers are less than pleased with the outcome, but they're still happy that something came of it.

"I think we did a great job settling this when the real bad guy went defunct," attorney Peter Macuga told the Dog. "We are as happy as we possibly could be, knowing the condition of the law these days and the ability we had to push the defendants to the wall with what we had."

Macuga said the firm had to weed through an intricate web of partnerships and ownerships involved with Newcom to get the settlements.

Although Newcom was broke by the time the settlement was reached, attorneys were successful in getting several of the company's former officers to personally pony up for the rebates. Three of the officers will shell out some $1.1 million in cash to help pay the costs.

What's more, the U.S. Attorney's Office in Los Angeles has filed various charges against some former members of Newcom's management. The alleged offenses include money laundering, mail fraud, wire fraud, and conspiracy.

They're Always After Me Lucky Charms

Dear Dog: I bought a 17-inch Pixie monitor model 750. About nine months later, the horizontal sync went. Pixie's web site is gone and so is its tech support. The three-year warranty is now just a piece of paper. What happened to the company? And how do I get this fixed?

—John Tran

The Dog Responds: Luckily, the Dog had an agent in the neighborhood of Pixie Technologies's last known location. When the agent arrived, however, he was greeted by a company that had nothing to do with Pixie, which apparnatly cleared out some months before. The short story is that Pixie Technologies is likely gone, and it's not cost effective for you to pay someone else to fix the monitor (turn it into a terrarium or fish tank instead). It's also recommended that consumers not buy any Pixie monitor without being assured of warranty support. Woof.

WatchDog

November 2003

Maximum PC takes a bite out of bad gear

This and That

Last month the Dog advised consumers to open their product packages before leaving the store, lest they be the victims of unscrupulous customers who swap out original parts for inferior parts before returning a product to the store. Well, two readers took issue with the advice. Mikhail A. Noel said he doesn't think it's always a consumer who does the swap out: "I suffered the same fate—three times. I ordered an ATI Radeon 9700 Pro from Amazon.com, and received a shrink-wrapped 9700 Pro box that contained an old ATI Rage 3D card. When I complained, I received yet another old ATI card. That happened twice. Eventually I gave up, asked for a refund, and ordered my part elsewhere. I doubt that a single unscrupulous customer was doing this."

Reader Kyle Howarth, on the other hand, said sometimes it's not so bad to get the wrong product: "I purchased a Western Digital 160 8MB cache hard drive at Best Buy in Flint, Michigan, for $99 after rebates. It was a steal. When I got home I noticed "200JB" stamped on the back of the drive. After inspection, and a confirmation through installation, I discovered that it was indeed a genuine 200GB 8M cache hard drive in 160GB packaging! What luck! I then went back to the store and looked for any more mislabels, because 50 cents per GB is hard to beat. The store had six drives left and four were 200GB models in 160GB packaging."

Yo Yo Dyne

Dear Dog: I just received a letter from my bank stating that my $40 rebate from CenDyne bounced and I was charged a $4 fee. Now I'm out $4. My bank said it will automatically try to redeposit it, and if that bounces, I'll be charged an additional $7. I called Staples to get a phone number for CenDyne. The salespersons aid he didn't have a phone number. But he read a memo that CenDyne went bankrupt and Staples has pulled all CenDyne products. Is there any chance of my rebate being honored? How can I get CenDyne to pay for my bank fees?

—Zach Lyman

The Dog Responds: Bad news, Zach. The Dog has confirmed that CenDyne shut its doors. The company didn't file for bankruptcy, however. It was put under a court-ordered receivership after one of its primary investors, TestRite, became skittish about the $15 million it was owed by CenDyne. All of the company's officers resigned, and the company is under the control of Rob Evans & Associates, which is looking to sell the IP and inventory to a new company.

A spokesman for Rob Evans & Associates told the Dog there's a strong possibility that a new company will buy the name and assets. Part of the deal could also include ongoing warranty and support for CenDyne's products as well as its rebates. However, if no one bites, all assets will simply be liquidated and consumers will get dust. The good news is that most of the drives CenDyne sold were repackaged drives by such companies at Lite-On and Pioneer. Firmware updates for those drives are easily found on the Internet.

So what did in CenDyne? To find out, the Dog contacted the former president of CenDyne, Mo Vahdati, on his cell phone. According to Vahdati, the poor economy was partially to blame. Under these trying times, consumer rebates are reaching unprecedented numbers. While previously as few as 20 percent of consumers applied for rebates, today it's more like 60 percent. Still, Vahdati told the Dog, CenDyne would have weathered the storm, until TestRite engineered a hostile takeover. Vahdati said he and other CenDyne officers intend to file suit against TestRite for alleged unfair business practices, conflict of interest, and breech of contract. "We are confident the judge and jury will fully redress this terribly callous injustice," said Vahdati.

So is it safe to buy the CenDyne products still on store shelves? Only if you're comfortable with what you're getting—no warranty and no product support.

Recall Alert: CRTs

Circuit boards in these monitors were bad; in the worst case, they would overheat and go up in smoke.

It's déjà vu all over again. IBM and Lite-On are voluntarily expanding a previous recall of monitors that may overheat, smoke, and create property damage. Last March, IBM recalled some 56,000 15-inch touch-screen CRT monitors manufactured between June 1997 and September 1997. A circuit board in the monitor can overheat and become a fire hazard. IBM originally received reports of five monitors going up in smoke. The original recall involved G51 and G51t monitors with the following model numbers on them: 6541-02N, 6541-02E, 6541-02S, 6541-Q0N, 6541-Q0E, and 6541-Q0S.

The expanded recall, which adds another 63,000 monitors, includes the original model numbers listed above but now includes all monitors manufactured between June 1997 and December 1998. Monitors made outside of the date range are not on the recall list. The bad monitors were made in China, Malaysia, and the United Kingdom.

Consumers with the suspect monitors should call IBM's repair center toll free at 866.644.3155 between 9 a.m. and 7 p.m. eastern time, Monday through Friday. The repair center will verify whether the monitor is bad. Those with bad monitors will receive a free inspection and repair or replacement of the monitor. More information is also available at www.pc.ibm.com/g51recall/. IBM said some 700,000 of the monitors were produced. About 377,706 could go up in smoke. Of that, 118,098 were sold in the United States.

WatchDog

Maximum PC takes a bite out of bad gear

Rated X

Dear Dog: My new digital camera uses SD Card memory. There are two types of SD available: One is your standard SD Card memory, and the other is 32x SD Card memory, supplied by Lexar Media. While some web sites claim the Lexar card to be faster than the standard SD Card, I didn't find one web site that didn't price the 32x SD Card higher. With some confidence, I purchased the 32x Lexar Media SD Card. Since then, I learned in conversations with two separate Lexar support guys that there's *no difference* between the speed of the 32x SD Cards and the standard SD Cards that Lexar carries. How pissed am I right now? Is it faster or not? Did the Lexar guys even know what I was asking? Was it just a brilliant marketing scam or what? Help me find the truth in all this madness.

—Robert J. Stewart

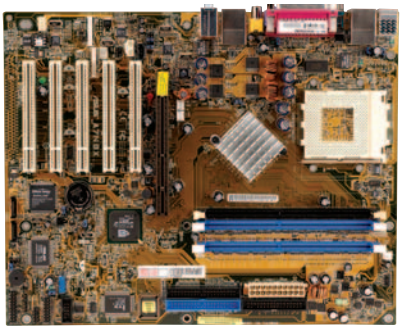
The Dog Responds: The Dog spoke to a Lexar representative who said that Robert was given incorrect information, or perhaps something was lost in translation. Lexar says it uses an "x" rating similar to the read- and write-speed ratings of CD-R drives, where one "x" equals 150KB/s. An SD card rated for 32x would guarantee a write speed of 4.8MB/s. SD cards without a rating offer speeds from 2.66MB/s to 4.8MB/s. On non-rated cards, Lexar doesn't guarantee any write speeds, thus one card may be a stellar performer while another could be a dog. It's similar to the way Intel deals with its CPUs: It takes a certain amount of silicon and tests it to operate at say 3.2GHz. The rest of the chips are then tested to run at say, 3GHz or 2.8GHz. The chips are then used to make 2.4GHz and 2.6GHz chips. Because the chips are only tested to operate at 2.4GHz or 2.6GHz and not higher, it's quite possible the chips are capable of running at the higher speeds. Usually as the process technology in silicon improves, the speeds also improve. Near the end of the run of the Pentium III CPU, many of the chips coming off the line likely operated at the highest speed but were sold at a lower speed for marketing reasons.

nForce2 400MHZ Support

Dear Dog: I just found out that Asus will not support the new 400MHz FSB Barton, as its boards are unstable at those speeds. However, I've read all over the Internet that NF2 boards should support it! A call to Asus (including almost two hours on hold—long distance) revealed that 200MHz support is not offered with old revisions of the board, only on rev 2.0.

That seems kinda fishy to me. It's the same motherboard model, same chipset, just a different revision to fix whatever problems it had!

What's worse, the tech told me the policy is to replace defective boards with the same revision. 1.04 and up will not work with 400MHz "Barton" Athlon XP. The only way I can get the new rev 2.0 board that is supposed to have fixed everything is to buy another one?



Rev 1.04 A7N8X Deluxe motherboards can now support 400MHz FSB CPUs, but many others still cannot.

—Norman

The Dog Responds: Like Norman, the Dog was surprised to hear that some nForce2 motherboards wouldn't support 400MHz CPUs. After all, nVidia had touted 400MHz bus support when the nForce2 was first announced in fall 2002. The Dog spoke with nVidia officials who said the problem was of a "chicken or egg" variety. While the chipset is qualified to run at 400MHz, a board's design may or may not accommodate the spec. According to nVidia officials, some board vendors did not have actual 400MHz frontside CPUs to test with their motherboards. nVidia has since taken steps to clear up the confusion: The new nForce2 Ultra 400 chipset and nForce2 400 chipsets denote support for 400MHz bus CPUs. The company says it unfortunately can't control how board vendors design their products.

For its part, Asus never actually marketed the first nForce2 motherboards as offering 400MHz bus support, claiming 400MHz bus speeds support only with the PCB revision 2.0 motherboards. So who's at fault here? It's hard to blame Asus since it didn't make any false claims. nVidia, on the other hand, evangelized 400MHz bus speed support as a feature of its chipset. It seems the company was more aggressive about pushing the feature than enforcing the support with board vendors. Of course, some responsibility also lies with motherboard reviewers and the tech news media for letting nVidia slide on the new feature without being a little more skeptical of the support.

This isn't a problem endemic to motherboard makers. We saw a similar situation arise with first-generation DVD+RW optical drives. Some vendors promised +R capability but reneged after it was discovered that a hardware, rather than firmware, update was necessary. The lesson the public should take to heart is that marketing claims can be deceptive. Try to read between the lines of product reviews. "Future upgrade support," for example, is a red-flag phrase that should always be considered critically.

The story has a happy ending, though: After hearing the complaints of *Maximum PC* readers, Asus sent its engineers back to the drawing board to add the missing 400MHz support. Indeed, boards with PCB revisions of 1.04 and higher now support 400MHz CPUs when used with the correct BIOS. (Please note that rev 2.0 boards use a different BIOS than 1.x boards.) Obviously, if you're shopping around, opt for the latest chipset and mobo revisions, but a doggy bone does go to Asus for listening to its customers and solving the problem for at least some A7N8X owners.

WatchDog

Maximum PC takes a bite out of bad gear

January 2004

Help, My Router Is Spamming Me

Dear Dog: Can you help me with a spam problem? Ever since I installed my new Belkin router, I've been getting spam windows and I can't figure out where they're coming from. I've installed anti-spy programs but I still get these odd pop-ups that won't go away even with reinstalls of the OS.

—Peter

The Dog Responds: Peter appears to be the victim of Belkin's misguided attempt to protect its users. Belkin admits that its own routers seemed to be spamming people.

"In our efforts to make home networking easier and less intimidating, we unintentionally overlooked the effect that this Parental Control sign-up issue would have," the company said in a press release. "We never intended to compromise the trust of our customers nor has it ever been our policy to deliberately spam our customers."

According to Belkin, the problem occurs when firmware on its older routers is updated or when any of its wireless routers are installed. At some point, the router pops up with an offer for a six-month trial of software that lets parents configure the router to restrict Internet access. The pop-up asks consumers to either activate the free trial or click "no thanks." If consumers click "no thanks," the pop-up goes away and stays away. Many people, however, don't click "no thanks," but instead close the window by clicking the X. If that's the case, the spam/pop-up window continually reappears. Belkin says it has sold thousands of routers mostly without complaint.

To fix the problem, Belkin is offering a firmware update on its web site that makes the pop-up window go away; the Parental Control feature will still be available for those who want it. Get the firmware at www.belkin.com.

EZ Vanishing Act

Dear Dog: On November 27, 2003 I ordered two ink-jet cartridges from EZ-Inkjets.com. The company promised delivery within a week. Giving them the benefit of the doubt, I patiently waited for two weeks before contacting the company. I have sent three faxes with no response. I have left messages at its California telephone number nine times at my expense. No response. I have sent mail as well. No response.

Although the company took my money, I can't even access my order information; the web site says I don't exist. Someone did email me an auto order confirmation in late September, but nothing else. All I want is my $45.93 back. I used a debit card of course. Dumb on my part. Please help.

—Ruth Wike

The Dog Responds: Bad news, Ruth. EZ-Inkjets seems to have disappeared. A visit to the site says it's under construction. And although the company's voice mail continues to function, no one responded to calls from the Dog.

Ruth isn't the only person unhappy with EZ-Inkjets. According to the Better Business Bureau, EZ-Inkjets is "unsatisfactory, based on a pattern of unanswered and unresolved complaints.

"Complainants allege they receive defective merchandise, and they are unable to obtain exchanges, refunds or credits for returned items. Some customers complain they purchase color cartridges that print in only one color. Others report cartridges simply do not work at all. Most complainants allege they are unable to contact the company, claiming the company fails to respond to emails and letters, and there is no listed phone number on the company website. The company responds to some complaints by contacting the customers directly, and resolving complaint issues. A few complaints were addressed by issuing credits or refunds. Most complaints are unanswered."

The Dog was unable to reach any officers of EZ-Inkjets for comment.

Although Ruth used her debit card for the purchase, she should check with her bank to see if she has any recourse. Most debit cards simply don't offer the protection of a good credit card. While not the cheapest lesson, it's better to learn it over a $45 product rather than a $500 videocard or system.

While it's unlikely that EZ-Inkjets will come back from its limbo state, if it does re-emerge, readers should consider it off limits and in the Dog House. Woof.

Scummy Scammers

Readers Tony Moffitt and David Conzatti want to alert others to the growing number of eBay and AOL scams going on. Both readers sent the Dog emails they received ostensibly from legitimate services asking them to submit personal information.

This isn't a new scam, but it's certainly becoming a favorite of scumbags online. The scammers, in the guise of AOL, eBay, or PayPal, send bulk email to innocent consumers. The spam invites the consumer to click a link to complain, but instead of being channeled to the official site, they're taken to a temporary web site where they're asked to "log in." The site logs the consumers' password and name, then coughs up a fake error message before forwarding the unwitting consumer to the company's real home page. Usually, the consumer doesn't even realize that he or she has been compromised for months. The lesson here is to be hyper-skeptical of any emails that ask for your personal info, and to make sure you are indeed at the web page you think you're at. You can do this by enabling the status bar in *IE*. In *IE*'s View menu, select "Status Bar."

February 2004: Watchdog Special Report—IBM's 75GXP Lawsuit

Dubbed the "Deathstar," IBM's 75GXP DeskStar drives were at the center of significant controversy in late 2003. The reason: IBM execs knew they were faulty, but kept selling them.

While IBM publicly conveyed that nothing was amiss with its 75GXP hard drives, confidential email and documents reviewed by *Maximum PC* show IBM employees in a near panic over the problem, grappling to find the cause and even calling the now infamous drive the "worst product in the field."

The emails all seem to contradict IBM's public stance that the 75GXP drive had no reliability problems; one email even details an exec ordering that drives rejected by one vendor because of reliability problems be sold elsewhere without anything done to correct them.

In another email exchange, an employee in IBM's Hong Kong office pleads with superiors to address the problem instead of trying to patch it with a public relations campaign.

"This is impacting our sales-out severely. The Corp. instruction is about communication to customers—not instruction in fixing the problem," the employee writes. "Sending highly defective product back into the channel did not help fix anything. Now bad-mouthing about IBM HDD is all over the market. We (must) start to do something to solve this. Distributors are rejecting this due to severe quality concerns—not business."

IBM Manager: Failure Rate "Beyond Normal"

An IBM manager agreed that the failure rate was "beyond normal" but refused to replace all of a customer's hard drives as it was beyond the warranty period.

The confidential email, depositions, and documents were unsealed last month in a California court as part of an ongoing class-action suit against IBM. The emails appear to show IBM in disarray over the problem, deceiving Compaq and deciding to sell drives that were rejected by one OEM to end users without any corrective actions taken.

Filed by Philadelphia firm Sheller, Ludwig & Badey, the class-action lawsuit alleges that IBM knowingly sold defective drives to consumers, and that the company never warned its customers that the drives were essentially ticking time bombs capable of destroying users' data. In response to a query from the Watchdog, hundreds of readers reported failures with the drives, which were popular for their capacity and performance. *Maximum PC* reader Michael Granito was the first to file a suit after he had several drives fail.

IBM has always maintained that the drives were no less reliable than other drives, and that the failures were well within the norm for the industry. In fact, IBM attorneys continued to maintain in a November court hearing that the problem was nothing more than high return rates by OEMs and distributors who couldn't sell drives, and by the consumers themselves who incorrectly installed the drives or overclocked their machines.

"These failures can be attributed to a lot of sources, but we don't think they can be attributed to IBM," an attorney for IBM told the judge who was considering whether to let the suit proceed or not. Company officials reached by the Dog declined to comment because of the pending litigation, but did say the suit was without merit. IBM sold its ailing hard drive to Hitachi in 2002 but maintains a 30 percent ownership of the unit.

The internal emails and depositions of IBM employees, however, seem to contradict what the company has publicly stated and what its lawyers maintain.

> ***RARELY DOES THE WATCHDOG DEVOTE HIS ENTIRE SECTION TO ONE STORY, BUT THE DOCUMENTS HE EXPLORED IN THE FOLLOWING LAWSUIT PROVED TOO JUICY TO RESIST. THE END RESULT? A WATCHDOG FOR THE AGES.***

Internal Documents Indicate 30 Percent Failure

Documents in the lawsuit show that 30 percent of consumers who received replacement drives for dead drives had the new units fail as well. Another document says some 11.3 million drives in the Telesto family were sold, including 4.1 million 5,400rpm drives (a majority of complaints the Dog received were about the 7,200rpm versions). The IBM documents show that the 5,400rpm drives had return rates of 1.76 percent and were classified as low risk drives. The 15GB, 30GB, and 45GB 7,200rpm 75GXP drives had return rates of 4.4 percent and were classified as low to moderate risk. Meanwhile, the 60GB and 75GB drives had 6.5 percent return rates and were deemed a moderate to high risk. Failure rates for some drive customers far exceeded 6.5 percent, though, according to IBM documents.

In one email exchange with Quantum, which integrated the 75GXP drives into its Snap servers, an IBM employee dejectedly sums up the problem:

"Basically in the new system (Snap 12000), IBM Telesto 75GB in a side-by-side qual test comparison with Maxtor 80GB finished with a dismal 10,000 DPPM, while Maxtor ran at 1,000 DPPM. I told the group that even with a microcode revision and screening, we probably cannot achieve a 1,000 DPPM," the IBM employee writes.

The situation became so bad that a Quantum executive chastised IBM in an email.

"While we appreciate that you have analyzed these failures and categorized them for us, we are extremely disappointed that you would ship a product with this known level of defects," a Quantum executive wrote to IBM. "You might recall that we had issues with the 60GB version of this product in October 2000. We were given assurances that you had corrected the defects found in your process. We now have fact-based reason to believe that the high defect rates we have experienced in this product are directly attributable to another series of defects in your drives."

"We Have Been Given False Data, Have Passed the Data on to Compaq"

Quantum ultimately was able to return 800 hard drives to IBM, but more troubling is an email that seems to show that IBM was unable to even distinguish newer generations of the drive called the "Rev 2" from older ones. The inability to track the older generation from newer generation helped put the kibosh on an 18,000 drive order from Compaq.

"The account team feels that we have been given false data, have passed the data on to Compaq, and used that data to convince them to take positive action in IBMs favor, and the integrity of the team and in fact the integrity of every IBM person on the conference calls with Compaq since the end of September has been compromised," one alarmed sales manager wrote to IBM execs about problems trying to get the drive qualified for Compaq. "If Compaq finds out that we have misinformed them and misled them, who is going to stand up next to the account team and explain how this happened? I feel we are at great risk. This program and future programs are at great risk."

One issue never actually resolved in the documents is the actual cause of the problem. Some of the problems stemmed from a bug in Windows 98 that created a false bad sector when the OS shut down before the write cache in the hard drive could be flushed. But there are also clear indications of manufacturing problems—something IBM has long denied. In the documents discussing a qualification for a Compaq contract, IBM speaks of a "Rev 2" model with a recessed head, newer firmware, an improved manufacturing process to reduce "contamination," and better quality assurance. IBM's promise of the improved Rev 2 convinced Compaq to continue using the drive, but when IBM exhibited difficulties in tracking whether the drives were Rev 2 or Rev 1, IBM sales reps became alarmed and triggered an email exchange that admits to misleading Compaq.

You Can't Do That!

In another potentially damning email, an IBM exec seems to suggest selling the hard drives that were rejected by a company to distribution, which meant a majority would end up in the hands of consumers.

"Due to quality problems, 2.5 percent factory failure rate, compared with 0.25 percent for competition," the IBM exec writes, "I have authorized the return of about 5k Telesto 60GB units built prior to Oct. 1. We can sell those units without rework in Disty."

Originally published February 2004

> ***"I'M SO HORRIBLY ANGRY RIGHT NOW THAT I'M READY TO SIMPLY GO TO THE BETTER BUSINESS BUREAU FOR SOME SERIOUS ASS-WHIPPAGE."***

WatchDog

Maximum PC takes a bite out of bad gear

March 2004

CodeUnderground Goes Underground

Dear Dog: In your December gift guide, you recommended an Xbox-to-PC adapter, which I thought was a great idea. But I have to wonder if you guys even tested it. Why? There is no web site named Codeunderground.com. None. Zero. Second, the controller adapter sucks big time. It doesn't work at all. It took 21 days for it to be delivered, and it didn't come with a driver. It's like buying a car without an engine. When I did find the driver for the adapter, WinXP detected it fine but the triggers didn't work. I did some research and found that I'm not the only one who has this problem. I just wish I did the research before I bought it. The only reason I didn't was because you guys recommended it in your mag. Right now, I'm trying to get my money back. I just want you to let others know not to buy this adapter. It's junk.

—Jim

The Dog Responds: At the time of our gift guide, CodeUnderground did exist at Codeunderground.com, but it appears that since publishing the item in December, the site has gone away for good.

In March 2003, CodeUnderground admitted it had been undergoing difficulties and said on its web site: "Since March 7, we have had about 10 support requests to every one cable order. Some of these requests have been from users claiming to have bought a cable—but they did not buy one from us."

CodeUnderground went on to say that the extra support costs seemed to be from another company that was selling a knock-off cable without the driver. According to the CodeUnderground site, that company simply linked to Codeunderground.com and shunted all its support there.

"We are currently in the process of deciding how best to continue, but for now, the driver and user support will remain free. We will also continue to sell cable adapters, so please, buy a cable. Please be considerate when requesting support. Rude, demanding, or insulting requests will not receive a response. Those of you who have purchased cables will continue to be supported regardless of what we decide. You can also expect to receive discounts on future products or services. We thank you for your support."

Apparently the cost of trying to support its own customers and those of the other company finally took CodeUnderground offline. The Dog was unable to reach any of CodeUnderground's principals as of press time. It goes without saying, the Dog recommends that consumers avoid the company's products.

The Dog wonders how Jim was even able to purchase his adapter. If, as he says, the site never existed, he couldn't have procured the adapter or downloaded the software from CodeUnderground. Is it possible he received one of the adapters from the competing company? That might explain why his experience with the device was so different from ours. Woof.

Counterfeit Alert

Nikon has issued a warning to consumers to be on guard against Nikon-branded counterfeit batteries that could overheat and burst. Nikon said the counterfeit batteries don't seem to feature a thermal safety that's built into Nikon batteries as well as those from other major battery distributors. Nikon doesn't say whether the counterfeiting is limited to specific battery lineups, but the only way to be sure is to purchase batteries from reputable dealers and to exercise common sense: If the battery seems too cheap to be true, then it probably is.

Copyleft.net Exits Stage Left?

Dear Dog: I ordered a great shirt from the web site www.copyleft.net in early December. My debit card was charged, the money removed from my checking account, and a confirmation email was sent. No shirt ever arrived. Follow-up emails go ignored, and the one other email address the site offers comes back as invalid.

Is the site defunct? What's going on? The DeCSS shirts were very cool and I know of several people who purchased them months ago with no problems.

—C. Holzman

The Dog Responds: There's bad news in geeksville. Copyleft.net, which sold T-shirts and merchandise promoting all things geeky, may be a goner. Among the goods Copyleft sold were shirts bearing the source code to DeCSS, which can be used to remove encryption from DVD movies. (The shirts were seen as a way to protest a perceived violation of first amendment rights.) Under the draconian DMCA law, reproduction of the code or linkage to a web site publicizing it was ruled illegal by the courts.

Holzman isn't the only person to complain about Copyleft.net. A perusal of the site's forums shows that other consumers have had similar problems. "I ordered one of these shirts in July and have received nothing. Not only that,

If you could actually read the code printed on this T-shirt, jack-booted thugs for the DMCA police might kick down your door.

but this jerk still has my credit card number and all my personal information," one supposed customer wrote. Another wrote, "Has anyone actually received one of these shirts yet?! I'm so horribly angry right now that I'm ready to simply go to the Better Business Bureau for some serious ass-whippage."

Others on the web site report that they did receive the shirts, albeit well before the holiday season, which is when the web site stopped responding to customers. Email from the Dog and phone calls to Copyleft.net went unanswered.

What happened to Copyleft? Perhaps jack-booted agents of the DMCA finally caught up with the site's owner. Regardless, given Copyleft.net's poor response to its customers, the Dog recommends that readers avoid the site like a mad cow. Woof.

WatchDog

Maximum PC takes a bite out of bad gear

Gone Fishing

Information thieves are trying yet another tack to steal your online financial information: pop-ups. Until now, what's been popular are "fisher" or "fishing" frauds, whereby unwitting consumers receive spam email inviting them to visit fake web sites made to look like eBay, Paypal, or a bank. But that method has pitfalls since it's possible for people to see the site they're actually at by looking at the address bar. Especially now that *Internet Explorer* has been patched to prevent spoofing the address bar. So frauders have turned to pop-ups, which can be made to appear over legitimate web sites as a way of fooling you. The Dog recently received a spam inviting him to visit Citibank.com. Click on the link, and you'll indeed land on Citibank's perfectly legitimate web site. The fraud occurs in the form of a pop-up that appears to be related to the site, and that asks you for "email verification" including debit card number and your ATM PIN. Scary, but prevention is simple. Never click a link to visit a financial institution; instead, open a new browser window and type in the URL yourself. If you're ultra paranoid, you may want to close all of your other browser windows first.

As a side note, ZoneLab's *ZoneAlarm* can now verify if you are indeed at eBay by comparing the IP address of eBay with what's in your browser. It's a good start. Eventually, we'd like to see *ZoneAlarm* and other apps ensure that we're actually at *every* site we think we're at.

AMD Locks Down CPUs

Dear Dog: I recently discovered that AMD is starting to lock down the multipliers on all its Barton processors, including the 2500+, which was guaranteed to be capable of overclocking to the speed of a 3200+ out of the box.

So far, nobody has been able to understand why AMD is doing this, nor how to unlock these new Bartons that we now call Thortons.

So my question is, *why* is AMD doing this, why has the company not officially released this bad news, and is there a way of unlocking the procs?

I'm sorry if this post doesn't actually pertain to an unethical vendor or manufacturer practices. I know that AMD has not done anything wrong. It's just that my friends and I would like an explanation for this.

—Lucas Allen Hester

The Dog Responds: Unfortunately, AMD appears to be succumbing to the same pressures that forced Intel to begin "clock-locking" its processors: bastard remarkers.

Remarkers take overclocker-friendly CPUs, which sell for, say, $80, and set them to speeds they can sell for $200. Do this a few hundred times and you can see that remarkers have the potential for huge profits. AMD wouldn't comment on just how much remarking occurred for it to change its policy, but Internet scuttlebutt indicates that enough resellers were receiving trays of remarked processors that AMD had to act. AMD's clock-locking also appears to be permanent. In the past, overclockers have removed multiplier locks by shorting processor pins and bridges. Now, like Intel, AMD is using a laser cut at the factory that cannot be reversed. Overclockers may not have control over the multiplier, but they can still increase the CPU speed by upping the bus speed.

AMD's policy extends from the Athlon XP to the Athlon 64 series. The company, however, says it will continue to leave its performance-oriented FX line unlocked. AMD believes FX buyers are enthusiasts and more sophisticated, and thus less likely to get ripped by remarking scams.

Recall Alert

Kyocera is recalling 140,000 batteries sold with its Model 7135 Smartphones, which may short circuit, overheat, and potentially burn the user. Kyocera says it has received four reports of battery failures with one report of a minor burn.

The phones were sold at Verizon Wireless, US Cellular, and ALLTEL Corporation stores, as well as through web sites and telemarketing retailers, between September 2003 and December 2003. Kyocera says the batteries were also sold separately for $21. Those with the defective batteries should immediately stop using the phone and contact Kyocera for a free replacement battery at 800.349.4478 between 6 a.m. and 6 p.m. Pacific Standard Time, Monday through Friday. More information is available at www.kyocera-wireless.com.

WatchDog

Maximum PC takes a bite out of bad gear

Is This For Real?

Dear Dog: I just found this web site that apparently sells computers that are so cutting-edge some of the components don't even exist yet. Some sort of anomaly in the space time continuum, thingy. Then again, who wouldn't like a 17,000 score in *3DMark 2003*, which is what this web site's advertisements boast? (The highest *3DMark 2003* score right now is around 10K.) The ads for these PCs also claim an overall noise level of 11dB (I wonder if anyone there even realizes that isn't possible except for maybe in a sound proof chamber). The web site also mentions a 500GB hard drive (once again, doesn't exist), not to mention the FX-51 3400+ processor (A64 3400+ yes, FX-51 3400+ no). Hell, it even goes as far as to offer a FX-51 3400+ in a laptop. The web site is www.michaelscomputers.com.

—J. Hoelle

The Dog Responds: Many readers have written to the Dog about the seemingly fantastic PCs offered by Michael's Computers. And the outrageous *3DMark* scores aren't limited to desktop systems. For example, Michael's web site claims its MX54 laptop with a 3.2GHz Pentium 4 and Radeon 9600 Pro videocard can spit out 13,411 in *3DMark2003*. That's pretty remarkable when you consider that none of the souped-up notebooks in *Maximum PC*'s April roundup could break even half that score.

Even more amazing are the endorsements by *Maximum PC* magazine and Sharkyextreme.com that appear on Michael's site. The fact is, *Maximum PC* has never reviewed a product from Michaelscomputers.com, and the Dog was unable to find any such review in the Sharkyextreme archives.

When *Maximum PC* EIC George Jones contacted Michael of Michaelscomputers.com, he was told the magazine's logo was used to represent official approval of components used in the computers, not the machines themselves. This isn't the first time Michael's has done this. Almost a year ago, Gamersdepot.com asked Michael's to remove its GD Drool Award after the logo was used to advertise a machine that was never reviewed by Gamersdepot.com.

To be fair to Michael's, the rules for logo usage aren't totally understood by all vendors; indeed, the *Maximum PC* logo has been used by other companies in the same manner—referring to components in a machine.

Nonetheless, Hoelle's observations about the unbelievable benchmark scores—particularly the near 18,000 in *3DMark2003*—and nonexistent hard drives do merit some examination. It's unlikely that even next-generation hardware could achieve two-thirds that score.

At press time, Michaelscomputers.com did not return phone calls or email. And more disturbing, the direct phone number for Michaelscomputers.com leads to a residence in Los Angeles, Calif. A woman who returned the Dog's phone calls had no knowledge of Michael's Computers and said she was just given the number two months before when she moved to the area. So Michael's Computers, where are you?

As a result of all the consumer uproar, Michael's Computers is the focus of an exposé on Tomshardware.com.

Not Knock-Offs, After All

Dear Dog: I'm a support rep from Lik-Sang.com's forums (www.lik-sang.com). I read in your March column that a reader complained about Code Underground going under. In response you mentioned "another company selling a knock-off cable." Many people have falsely blamed Lik-Sang for Code Underground's problems.

Lik-Sang's Xbox-to-PC converter is no knock-off, and full driver support is available.

Rest assured the [Xbox adapter] cable sold at Lik-Sang is not a "knock-off" but rather a factory-made cable, as opposed to the home-made cables of other companies. Lik-Sang is a successful company in Hong Kong that won't disappear anytime soon, and we have a forum with support reps like me and many other knowledgeable users who can answer support questions about the Xbox adapter or any of the company's other console game adapters.

As a matter of fact, we have a sticky post which has not one but three working Xbox controller drivers (including an archived copy of Code Underground's driver), and the independently developed XBCD driver we have linked is the best one available.

We have no reason to, or interest in, linking to another site for support requests as we possess greater resources to solve users' problems. Also, Lik-Sang cannot include a driver disc with the adapter because: 1) There are three different drivers, and the best one is updated frequently; and 2) the drivers are copyrighted. I think if you try the Lik-Sang Xbox adapter with the XBCD driver we have provided in the forums, you will find it's the best around.

—TJ

The Dog Responds: Noted. On a related issue, one of the CodeUnderground creators told the Dog the site expected to make a comeback, but as of press time, codeunderground.com was still nonexistent. As TJ said, drivers for the CodeUnderground converters are available at Lik-Sang.com.

WatchDog

Maximum PC takes a bite out of bad gear

June 2004

Pirates Screw Everybody

Editor's note: In Our June 2004 issue, the Dog sifted through the pile of mail and noticed a distinct pattern of chatter: The latest round of anti-piracy software is totally whacked, to use the parlance of our times.

Dear Dog: I know you deal more with hardware, but I figure a hardcore dog like yourself might also frag like the rest of us. I bought *Unreal Tournament 2004* after playing the sweet, sweet demo. After installing all six discs, though, I received the following error message: "Insert the original disc instead of a backup. See www.securom.com/copy for more details." That web address at SecurROM.com tells you nothing more than: "You are trying to start a copy-protected application which requires the original disc to be in the CD/DVD-ROM drive. Please check to make sure your disc is an original."

Boy, did my jaw drop! I spent the next few days trying to get it to work with very limited success. Atari has yet to answer my email and the community is pretty mad too!

I don't know where we'll be come LAN-party time if we can't use *UT 2004*. We might have to revert to playing, ugh, *Counter Strike*. Help!

—Aaron H.

Dear Dog: The *Far Cry* demo was fun to play and I would buy the game except for the tiny warning at the bottom of Ubisoft's shopping site: "This game contains technology intended to prevent copying that may conflict with some disc and virtual drives."

I understand the need for copyright protection, but will Ubisoft refund my money when its game refuses to run on my drive, or will I be bounced back and forth between software company and retailer? Watchdog, please warn the public.

—Ron Harper

The Dog Responds: If you see a pattern, raise your paw. It appears that game publishers' latest anti-piracy software takes issue with the virtual drive software that lets people copy software to their local hard drive and run it as though it were still on the CD or DVD. This may not be by mistake, either. While virtual drive apps are mostly used for legitimate purposes, such as on a mini-laptop or Tablet PC that lacks an optical drive, it's also become a recognized tool of game pirates. In some cases, the conflict results from legitimate commercial software such as *Norton Ghost*, *Nero*, and *WinImage* because they install a virtual drive to work. And the problem isn't confined to *Far Cry* and *Unreal Tournament 2004* either. We've heard similar reports of problems with other new games, such as *Pain Killer*. In some cases, disabling the virtual drive software is enough to let the game run, but the Dog has also heard reports that the software must be completely uninstalled for the game to work.

Even worse, sometimes the software's not the problem, the hardware is. Some older CD-ROM and DVD-ROM drives can't work with the latest anti-copying software. Game publishers are advising people who experience problems to get the latest firmware update, but older drives are often unsupported.

So where does that leave the consumers who legitimately purchased a game that they're unable to play? Ubisoft, publisher of *Far Cry*, told the Dog that if a consumer has exhausted all troubleshooting methods, a replacement or exchange is possible. Atari, publisher of *UT2004*, says it has a special executable that should correct the problem for most consumers, but the executable must be obtained by directly calling Atari's support.

While some of the blame should fall on the game publishers and the anti-copying vendors SecuRom and SafeDisc, much blame also rests on the shoulders of game pirates who have put the publishers in this precarious position. The Dog has this message: If you love PC games, buy some. Woof.

How to Shop Online, the Safe Way

1. Visit www.bbb.com and search the Better Business Bureau's files for complaints about the online retailer you're considering. Then check www.ResellerRatings.com, a site where consumers rate online stores. A good record is generally enough to tell you that a store is reliable. Keep in mind that every store will have a few registered complaints, so don't let one or two negative comments spook you. In fact, stores with too many clean reviews raise our suspicions.
2. Read and print *all* of the store's policies. What's the return policy? What is the restocking policy? How long will the store warranty a product before you have to send it directly to the manufacturer? Is there a restocking fee for DOA equipment?
3. Keep detailed records. When you buy online or have conversations with customer service, write down who you spoke to, when you spoke to them. And get a confirmation number from your contact! If the transactions are online, print out the confirmation information and keep it in a safe place.
4. Use a credit card with a good fraud protection policy. Do not wire payments, send cashier's checks, or personal checks. A credit card will protect you if the deal goes sideways. PayPal won't.
5. If the deal does go bad, immediately call your credit card company and reverse the transaction. Make sure you submit a reversal request in writing before the credit card company's deadline expires. Unscrupulous stores will deliberately delay responding to your inquiries until the deadline has passed.

The Year in Reviews

All the reviews from the past year that are fit to print.

Each month, *Maximum PC* reviews between 20 and 30 different products. With the exception of games and the occasional photo editing, music management, and productivity software evaluation, the great portion of these reviews are hardware-oriented. As you've already read over the course of this book, our tone and style for rating products is unique. We don't play it conservative and we don't mince words; after all, if you're going to drop hundreds of dollars on a PC, PC component, or gadget, it's important that you know what you're getting.

Because we take such great pride in our reviews, and because we believe them to the be the most reliable verdicts around, we decided to compile every single review rating from the last year's worth of *Maximum PC* and present them to you for your reference. Each review consists of four elements: the name of the product, what rating it received (we rank products on a scale of 1–10, with 10 being best), and a short synopsis of the products' good and bad points (when applicable). The reviews are broken down alphabetically within each listed category.

Motherboards

Product Name	Issue Reviewed	Rating	Pro	Con
Abit IC-7 G	08/2003	9	Good price and awesome overclocking features.	Visually blah, and not the top performer.
Albatron K8X800 Proll	03/2004	9	Partial 24-bit audio and dual BIOS.	Not as compatible with memory as Aopen motherboard, and lacks a socketed BIOS.
Aopen AK86-L	03/2004	8	Most compatible with the RAM we used.	BIOS is soldered and not socketed, and the board lacks FireWire.
Asus P4C800 Deluxe	08/2003	9	Highest benchmarks of the roundup, except in audio tests.	As visually exciting as a Chevy Citation, sparse on audio jacks, suffers some design quirks.
Chaintech 9JCS Zenith	08/2003	9	Fast, packed, and stacked with features.	Expensive, strange audio choices, and we're not big fans of baby blue.
DFI Lan Party KT100A	08/2003	6	DFI knows how to accessorize, snap!	The KT400A ain't an nForce2, and what's up with the damned jumpers?

Product Name	Issue Reviewed	Rating	Pro	Con
DFI Lan Party Pro 875	08/2003	8	Cool color, good accessory bundle, and unique RAID "1.5" feature.	Lacks FireWire, and stock system bus speeds are a little more conservative than the other three.
Gainward FX Powerpack Ultra/760 XP Golden Sample	06/2003	7	Video-in/video-out is always welcome.	The board isn't as fast as its $200 competitor, and doesn't overclock as well either.
MSI K7N2 Delta-ILSR	08/2003	9	Sexy PCB and dual-channel memory. Six-layer design is good for bragging rights.	Relies too heavily on rear-panel brackets, and let's face it, even the nForce2 doesn't match the power of the 875P.
MSI K8N Neo Platinum Edition	07/2004	9	Flexible RAID options, native Serial ATA support, and a built-in hardware firewall.	Black PCB isn't quite as flashy as the red PCBs MSI normally uses. No APU audio.
MSI K8T Neo-FIS2R	03/2004	7	Multitude of storage options and a red PCB.	Problems with 512MB Corsair Micro modules.

Graphics Cards, Video Devices, and Displays

Product Name	Issue Reviewed	Rating	Pro	Con
Asus 5900 Ultra	11/2003	7	Great performance in today's games, and a smaller, quieter heatsink.	Software 3D deceleration: Concerns over *Half-Life 2* performance abound.
ATI All-in-Wonder 9800 Pro	07/2003	9	Fast 3D acceleration, a great TV tuner, a fully functional remote control, and software to tie the whole package together makes this a sure winner.	It's not the fastest 3D accelerator anymore, and we're anxiously awaiting hardware that will let us control our cable boxes.
ATI Radeon 9600 Pro	06/2003	8	Fast, overclocks like a madman, and costs significantly less than a kidney.	At its stock speeds, it's nowhere near as fast as the top-shelf 9800 Pro.
ATI Radeon 9800 Pro 256MB	07/2003	9	Damn fast, OC-friendly memory.	No longer the fastest board around, and $500 is very expensive for a board that's not the fastest.
ATI Radeon 9800 XT	12/2003	9	Fast as fast can be, especially when you fire up the programmable shaders.	Stupid expensive. We've seen cars that are cheaper.
Cornerstone P1750	07/2003	7	N/A	N/A
Dell UltraSharp 2001FP	06/2004	9	Functional design, nice big screen, good gaming performance.	Less-than-perfect resolution of dark grays against a black background.
DoubleSight 15" LCD Monitor	04/2004	6	Space-saving design, nice color and grayscale reproduction, convenient monitor-toggling.	The lack of a hinged center presents problems with glare and restricts usability.

Product Name	Issue Reviewed	Rating	Pro	Con
Gainward FX Powerpack Ultra/760 XP Golden Sample	06/2003	7	Video-in/video-out is always welcome.	The board isn't as fast as its $200 competitor, and doesn't overclock as well either.
Gainward FX PowerpPack	11/2003	6	Very cool, brightly lit fan looks great, and performance is stellar for a $400 card.	*Half-Life 2* concerns hit Gainward too. Ridiculously long name.
GeForce 6800 Ultra	07/2004	9	Double the speed of last-gen cards, with support for pixel shader 3.0.	Another two slot solution, and with a massive power supply requirement to boot.
GeForce FX 5700	01/2004	8	Great performance, decent overclockability, and a quiet single fan.	It's not as fast as a top-of-the-line board, but it costs half of what the GeForce FX 5950 does.
GEForce FX 5900 Ultra 256MB	07/2003	9	It's the fastest card available today—and quiet enough to run without earplugs!	Takes up the PCI slot next to your AGP slot. Not much faster than other DirectX 9-level cards in current games.
Hauppauge Media MVP	01/2004	8	Music, pictures, and video playback over a network at a rock bottom price.	Lack of support for some common formats.
Hy-Tek Panel 300	02/2004	8	Bright, bright screen and upgradeable parts make it better than any other Media Center PC.	533MHz bus processor and single-channel DDR bring performance way down.
NEC FE2111	07/2003	7	N/A	N/A
NEC MultiSync FE2111	07/2004	9	Beautiful image quality and text reproduction.	Beige cabinet is uninspired.
Planar PL170	06/2004	8	Inexpensive, good gaming performance, acceptable image quality for most applications.	VGA interface, inflexible neck, banding problems in *DisplayMate*.
Plextor ConvertX PX-M402U	07/2004	9	Easy to use, and comes with everything you need to make great video captures.	Compatibility issues on some systems left us leery.
PNY Verto GeForce FX 5950 Ultra	01/2004	9	Damn fast, and the problems with programmable shaders seem to be a thing of the past.	When the next-gen parts from nVidia and ATI hit in the spring, this card is going to be obsolete.
Radeon 9600 XT	01/2004	8	Great programmable shader performance for less than $200, and no external power requirement.	The 128-bit memory interface and slow memory ultimately cripple this board's performance.
Radeon Rhapsody	09/2003	9	A faster memory clock and a more OC-friendly core gives the Xtasy 9800 Pro a Kick Ass award.	Even with the latest ATI driver update, the 9800 Pro is still slower than the GeForce FX 5900 Ultra.
Radeon X800 XT Platinum Edition	07/2004	9	Top speed, great image quality, and double the performance of last-gen videocards.	We're concerned by the lack of Pixel Shader 3.0 support, but not enough to pull our recommendation.
Samsung SyncMaster 172X	06/2004	9	Stylish frame, satisfying *DisplayMate* performance.	Limited height adjustment, "hidden controls."

Product Name	Issue Reviewed	Rating	Pro	Con
Sapphire Radeon 9800 XT	02/2004	9	Great performance and value pricing online. Street price is closer to $450 than $500.	It's cheaper, but there's no *Half-Life 2* coupon. Next-gen GPUs are just around the corner.
Sony E540	07/2003	4	N/A	N/A
Sony GDM-C520	07/2004	9	Crisp, clear, and color-accurate image quality.	Pricey, and less-than-perfect text reproduction.
ViewSonic P225F	07/2003	6	N/A	N/A

Soundcards and Speakers

Product Name	Issue Reviewed	Rating	Pro	Con
Acoustic Authority A-3780	03/2004	3	Awesome power and sound at reasonable volumes.	Questionable long-term viability; speakers blew out in testing.
Altec Lansing MX5021 Speakers	05/2004	6	Decent satellites, nice look, includes a remote control and polishing cloth.	Weak subwoofer, too-tall satellites, overpriced.
AudioTrak Prodigy 7.1	07/2003	8	24-bit support and the ability to redirect audio streams.	Some games will still suffer a frame rate hit.
Creative Inspire T7700	12/2003	6	Decent sound, standard speaker cables, and a whole lot of speakers for nifty positional sound.	We'd rather blow our speaker budget on a great set of 2.1 speakers than a middling 7.1 rig.
Creative Labs Audigy 2 NX	04/2004	9	Automatically reconfigures audio on your notebook when disconnected.	Volume knobs are difficult to use and there is no EAX 4.0 support. Sluggish frame rates.
Creative Labs Gigaworks S750	02/2004	8	Outstanding satellites, lots of nice touches, closest thing to a home movie theater we've heard.	Subwoofer lacks power, control pod feels flimsy.
Creative MegaWorks THX 6.1	10/2003	9	The sixth satellite Creative added to the MegaWorks really enhanced DirectSound3D games.	The satellites can't hit as high a note as we'd like, and we miss the digital input.
Klipsch ProMedia Ultra 5.1	11/2003	9	Astounding audio fidelity with distortion levels low enough to make a brave man weep.	No digital decoder and no remote make Homer something something.
Line 6's Guitar Port 2	05/2004	9	Amp modeling, automatic hum reduction, and PC/guitar interface? Sold.	It's not easy to find help on using Guitar Port with recording software.
Logitech Stereo USB 300 Headset	06/2004	6	Great microphone performance and decent audio.	Bass response is lacking.
Logitech Z-2200	02/2004	9	Excellent fidelity, amazing power.	Um…only two satellites?
Logitech Z-5300	01/2004	8	Above-average sound, thumping bass, cool sat design.	Nonstandard speaker wires, no digital decoder, no tweeters.

Product Name	Issue Reviewed	Rating	Pro	Con
Mad Dog Entertainer 7.1 DSP	03/2004	6	For less than the price of a good mouse, the Entertainer 7.1 serves up more satellites than Neptune.	Doesn't live up to box claims of "24-bit" or DSP. Doesn't work with Creative 7.1 speakers.
M-Audio Revolution 7.1	06/2003	7	Excellent fidelity and good bundle makes the Revolution 7.1 the first 24-bit alternative to the Audigy and Audigy2.	Reliance on CPU for heavy lifting can potentially drag down frame rates in games.
MaxxBass MiniWoofer	05/2004	6	Decent output considering how small it is.	Overall anemic bass, limited connection options, high price.
Philips Aurilium	04/2004	8	Bus powered, and the Qsound 3D effects are very pleasing.	Must reconfigure audio in order to get sound back on when the card is unplugged from a notebook.
Plantronics DSP-500	06/2004	9	Built-in DSP, impressive performance, and comfortable to use.	DSP housing is slightly cumbersome.
Sound Blaster Audigy 2 ZS Platinum	01/2004	9	Excellent sound, great software bundle, DVD-Audio support.	DVD-Audio lacks title support, not enough of an upgrade for Audigy 2 owners.

Storage Devices

Product Name	Issue Reviewed	Rating	Pro	Con
Addonics 18-in-1 Multi-Function Recorder	03/2004	8	The MFR is just as convenient to use on the go as it is at home.	DVD read speeds are very slow, and the drive doesn't support disc spanning.
Apricorn EZ Writer	11/2003	9	Ultra-sleek. Super-light. Easy to connect. Easy to use. Looks great too.	High-priced. Behind-the-curve burning times, and to only one of the major DVD formats (DVD-R/W).
Archos ARCDisk 20GB x	12/2003	9	Majorly portable and affordable.	File transfers are a bit slow.
EZQuest 250GB External Cobra Combo Drive	07/2004	9	Huge capacity, quiet operation, and good software bundle.	Large size and weight restrict portability.
Freecom USBCard	05/2004	8	Slim design, great portability.	Short connector cable.
Hitachi 7K400 Deskstar	06/2004	9	Huge, fast, with enterprise class components and features.	Has to be a 10K drive to receive a 10 verdict.
Hitachi Deskstar 7K250	01/2004	9	Blistering performance across the board, ninja-like.	Pricey.
I/OMagic 8x Dual-Format DVD Burner	01/2004	5	It's cheap. Really cheap.	It's slow. Really slow.
LaCie 20GB FireWire/USB 2.0 Data Bank	09/2003	6	It's the smallest drive we've ever seen that sports both USB 2.0 and FireWire connections.	The initially startling design gets tiresome almost immediately. The internal drive is slow.

Product Name	Issue Reviewed	Rating	Pro	Con
Lexar JumpDrive Traveler	05/2004	7	Provides solid privacy options.	Broken quick-launch feature, limited app support.
LG Super Multi GSA-4082B 8x DVD Burner	07/2004	6	The Super Multi supports all three major DVD formats—like it or not—and does so capably.	Lack of support for DVD-RAM cartridges is weirder than software called "Gold Basic." Picky about media.
LG Triple-Format DVD Burner	12/2003	6	The drive supports industry-standard 4x burning to DVD-R and DVD+R.	It's questionable that you'll ever find DVD-RAM, as implemented in LG's burner, of any use.
Lite-On 52/32/52 CD Burner	10/2003	9	Same high-quality drive for the same low price, but now in a tidy case perfect for small systems.	Comes with Nero 5.5 instead of the new Nero 6. Seek times could be better. Drive tray is rattly.
Lite-On LDW-811S 8x Dual-Format DVD Burner	04/2004	9	Lite-On delivers another scorchingly fast drive for a great price.	What's up with the musty old software package?
Maxtor DiamondMax Plus 250GB	01/2004	8	Respectable performance across the board, and quiet.	Sluggish "real world" performance.
Maxtor One Touch 250GB	05/2004	9	Huge drive, fast performance, easy to use, rugged package.	Missing a few small, handy features found in the WD drive.
Memorex 4x Dual-Format DVD Burner	11/2003	8	The Memorex's DVD burning times are just a hair behind those of Pioneer's DVR-A06.	Its CD burning times aren't great, and DVD+RW is stuck at 2.4x instead of the more up-to-date 4x.
Memorex True8x DVD Burner	04/2004	8	Memorex delivers another reliable, competent drive with an all-you-can-eat software bundle.	Drive can't write at 8x to 4x media as other drives can; access times are not so great.
MSI 52x CD Burner	10/2003	8	We could do worse than have yet another great drive at a low cost like this one.	As with the Lite-On, seek times could use some improvement here.
OWC Mercury On-The-Go Pro 60GB	11/2003	9	Feature-laden and muy rapido.	No included software for PCs.
Pioneer DVR-A06	09/2003	9	The valedictorian of DVD burners—great burn times across the board.	CD burn times are slow, and couldn't they dress up the bezel a wee bit?
Plextor 8x Dual-Format DVD Burner	12/2003	9	The fastest DVD burner available.	Audio extraction can be slow, and reading from CD-ROMs remains at 40x.
Plextor PlexWriter	07/2003	10	The PlexWriter 52x is simply the fastest, most capable, refined, and feature-packed optical drive we've ever tested.	32x CD-RW media is nowhere to be found. Using "Rec" features restricts burning to 4x. The LED may be a third of a lumen too bright for our tastes.
Plextor PX-504A	06/2003	9	Yet another benchmark-crushing winner comes out of the Plextor stables.	But it's hobbled by so-so software and the CD burning speeds of yore.
Samsung SW-252B	06/2003	5	A fat 8MB buffer could reduce the reliance on buffer-underrun protection on older machines.	Plodding read speeds rarely exceeded 40x.

Product Name	Issue Reviewed	Rating	Pro	Con
Seagate Barracuda 7200.7	01/2004	8	Solid performance and good seek times.	Limited warranty and a wee bit loud.
Simpletech 80GB USB/FireWire External Drive	07/2004	6	Huge capacity, USB, and FireWire interface.	Buggy software, not bus-powered, overpriced, slow rotational speed.
Sony CRX220A1	06/2003	7	There's something to be said for a drive that installed and operated without any hassles at all. Snappy seek times.	Read and write times sit behind the curve. And that's not what anybody wants in a 52x drive.
Sony DRU-530A 8x Dual Format DVD Burner	02/2004	8	Fast, pretty, and easy—just the way we like 'em.	The DRU-530A's speeds are toasted by Plextor's PX-708A.
TDK 8x Indi DVD Burner	05/2004	7	Writes at 8x to certain brands of 4x media, great documentation.	Performance is below average.
TDK indiDVD Dual-Format DVD Burner	08/2003	9	The dual-format burner is the only solution for the dual-format wars.	Audio extraction still suffers in this drive, and we'd prefer a few higher-quality software titles.
Verbatim Store 'n' Go	12/2003	9	The fastest USB 2.0 flash drive we have ever tested thus far. Tiny yet rugged design.	If you are to lose any part of the unit, it will likely be the drive itself and not the cap.
Western Digital 2500JB	07/2003	8	Great all-around performance. Gigantic capacity.	Not as fast as the latest IBM GXP in writes and I/Os.
Western Digital 250GB Media Center	05/2004	9	Big capacity, fast, easy to use, snazzy media center.	Twice the cost of the desktop version of the same drive.
Western Digital 740GD Raptor	02/2004	10	Stylish performance, decent capacity, quiet operation, and a five-year warranty.	New features are only beneficial in a multi-user environment.
Western Digital Caviar SE WD2500JD	01/2004	7	Highest read/write speeds in the group, cool connector.	Slowest seek times, lowest burst rates, loud operation.

Networking Devices (Includes Media Servers)

Product Name	Issue Reviewed	Rating	Pro	Con
Ambicom Wireless Print Kit	01/2004	7	OS agnostic and doesn't require any drivers.	Slow data throughput and random disconnects.
Belkin Hi-Speed USB 2.0 7-Port Hub	01/2004	7	Convenience and glamour in a USB hub.	No FireWire ports and the power supply is humungous.
Corinex Powerline Router	06/2004	2	This product didn't do us physical harm, but it could have. Electricity kills.	Slow and difficult to configure. Did we mention it's worse than wireless in every way?
Creative Labs Wireless Music	03/2004	7	The remote's screen makes couch browsing easy, even with large music collections.	The hiccups on startup are unacceptable, and the server program should be a background service.

Product Name	Issue Reviewed	Rating	Pro	Con
D-Link Air 660W Wireless CompactFlash Adapter	08/2003	9	Good signal strength, good range, great software tools.	On-or-off connection.
D-Link AirPlus XtremeG	01/2004	9	Lightning-fast file transfers are capable with this outstanding 802.11g router.	Understandably, the fastest 108Mb/s mode works only with other D-Link products.
D-Link DP-311U Wireless Print Server	01/2004	8	Snap to set up and works with most printers.	Slow speed on some printers, doesn't send toner level info.
D-Link USB 2.0/Firewire Combo Hub	01/2004	9	Includes FireWire and USB 2.0 ports in a small package.	So light it's easily yanked around a desk.
Linksys Wireless Compact USB Adapter	08/2003	7	Plugs into any USB 1.0 port, and is sturdy, solid, and built to go places.	RF interference can occur if you plug directly into the USB port; possible network dropouts.
Linksys WRT54GS	06/2004	9	Lightning-fast 802.11g performance, without borking your neighbor's network.	No reason to upgrade from your existing 802.11b or 802.11g if you use Wi-Fi solely to share broadband.
Martian NetDrive Wireless 120	10/2003	7	A small, ultra-quiet home server and printer server that will work on Ethernet or Wi-Fi.	A net-connected Linux box should do more than just share files and printers.
Microsoft Base Station MN-700	01/2004	8	So simple to configure, even your grandmother can do it. Seriously.	Poor operation in mixed mode means that this router works best in 802.11g-only environments.
Slim Devices Squeezebox	03/2004	10	The excellent interface and server software makes this a must-have for any audiophile.	Three hundred bucks is a tad expensive, but the Squeezebox is worth every penny.

Peripherals (Keyboards, Mice, Scanners, Printers, etc.)

Product Name	Issue Reviewed	Rating	Pro	Con
BenQ x120 Internet Keyboard	07/2004	8	Slim keyboard design performs perfectly, F-keys perform as they should.	The low profile of the keys may feel awkward to some typists.
BFG Technologies Sniper Boomslang 2100	04/2004	6	High resolution and great precision are terrific in games.	Goofy design makes us wonder if the engineers who designed it are trackball users.
Canon i70	11/2003	8	Pretty fast for a portable printer.	Print quality is a notch below that of the HP.
Canon i9100	12/2003	9	Gorgeous prints in a flash.	No 4x6 cartridge. Prepare to surrender a lot of desk space to this big bertha.
Canon i9900	07/2004	9	Improved green output and incredible speed.	Front USB port should support devices other than digicams.
DocuPen	05/2004	4	The DocuPen is small and ingenious—low-rent spies will love it.	It takes a hell of a steady hand to create a good scan, and the internal memory is measly.

Product Name	Issue Reviewed	Rating	Pro	Con
Epson Photo Stylus 900	07/2003	8	Does what no other consumer inkjet can do—prints directly onto CDs. Supports a vast array of paper sizes. Rich, deep colors with photo-quality paper. Very easy to use.	Color fidelity on CDs is low, "black" never comes out black, and discs smudge fairly easily. Inkjet text is still inkjet text, at least on plain paper. Price "consumables."
Epson Stylus Color 2200	04/2004	9	You'll get dazzling, I-can't-believe-it's-not-butter color prints from the Stylus Color 2200.	You'll pay a premium for the privilege, and you'll wait a long time for it, too.
Fingerworks Touchstream LP	12/2003	4	Portable, very ergonomic.	Way too sensitive, learning curve is too steep.
HP 450cbi	11/2003	8	Superior image output and excellent text quality. Lots of connectivity options.	Slightly bulky design, and boy is this thing ever slow!
Ideazon Zboard	07/2003	6	The key action is OK, the graphics are neat-o, and it never hurts to have a labeled interface for different games.	We can't see shelling out $20 per game or application for a device with such limited value.
Konica Minolta Magicolor 2300W	04/2004	8	Fair quality color output—especially considering it's the cheapest color laser we've ever seen.	The output is still far from photo-quality, and lacks full-bleed printing ability.
Logitech Cordless Desktop MX for Bluetooth	01/2004	9	A solid-performing mouse and keyboard tempt us, but the Bluetooth adapter seals the deal.	The new "improved" F-keys still annoy the hell out of us. Change is bad!
Logitech MX510	07/2004	9	Pixel-perfect accuracy and lightning-quick response in a comfortable package.	No side-to-side scroll wheel makes us sad.
Microsoft Intellimouse Explorer 4.0	02/2004	10	Perfect sensitivity, a great button layout, and the new uber scroll wheel is rad.	It isn't wireless, but some would call that a plus.
Microsoft Wireless Desktop Elite	12/2003	7	Good response. The scroll wheel on the keyboard rocks.	No rechargeable batteries! Limited key programming options. Function lock sucks.
Nomus 3G	06/2003	6	Easy to use, and good for you.	Incompatible with ergo keyboards, unsuitable for gaming.
Nyko AirFlo Mouse	04/2004	9	Cool air on our fingers makes us happy.	No side buttons doesn't cut it these days.
Nyko AirFlor PC Gamepad	05/2004	8	The 10-foot cord is handy, and the price is right.	AirFlo technology doesn't add much to this gamepad.
Saitek P3000 Gamepad	11/2003	9	Great response, a comfortable design, and a wireless connection to boot!	Lack of a rumble function is all that separates the P3000 from a perfect score.
Saitek ST90 Joystick	11/2003	7	Cheap enough to get the job done.	No rudder and no throttle means this stick is a no-go for serious simmers.

Product Name	Issue Reviewed	Rating	Pro	Con
Scanjet 4670	05/2004	9	It's not often a distinctive design also happens to be a user-friendly one.	"Ghost" colors sometimes appear in high-res scans, and the transparency adapter is abysmal.
Sony Puppy	12/2003	8	You can forget your 20-character passwords if you have the Puppy and a finger!	It doesn't look, smell, or taste like a dog. Why the hell is it called the Puppy?

Pre-Built Systems, Cases and Case Mods

Product Name	Issue Reviewed	Rating	Pro	Con
ABS Mayhem G1	04/2004	8	Killer price and fair performance.	Could benefit from using dual-channel memory.
Ahanix Blu III	12/2003	7	Cool-looking LCD display, trap doors for optical drives, ample fan mountings, affordable price.	LCD is more show than go, and overall the package is rather low-budget.
AI 4600 64Bit	01/2004	8	Over-the-top specs, attractive pricing.	Not as fast as Intel; low-rent case and paint job.
Alienware Area 51M	04/2004	9	User-interchangeable graphics, 3.2GHz Extreme Edition Pentium 4.	Only supports single-channel RAM.
AMS Gbox CFI-S968	07/2003	8	Logical port placement, well-thought-out interior.	Piercing system beep, and the installed AGP card blocks the sole window.
Antec Aria	06/2004	9	The big 120mm fan makes it a cool machine.	Matching a mobo to the Aria requires some research.
Aopen XC Cube	02/2004	8	Elegant and quiet.	Lacks 400MHz FSB support and not as solid as the other two contenders.
CasEdge Diabolic Minotaur	07/2004	7	Unique look, screwless design, loaded front I/O port.	Inadequate cooling, poorly designed interior.
Chenbro PC6166 Gaming Bomb	04/2004	9	Screwless design, support for different size fans, useful front I/O port, affordable.	Flimsy plastic arms on the screwless PCI card locks, no motherboard tray.
Cooler Master Centurion CAC-T01	12/2003	6	Genuine aluminum front bezel, front-panel connectors.	Low-rent construction through and through.
CyberPower Infinity 5900 Pro	09/2003	7	Very good performance at a great price.	Piss-poor wiring job, and a weird optical config, but what do you expect at $2,200?
Dell XPS	04/2004	10	No-compromise performance that's faster than most desktops.	Just a little lighter and smaller than the anchor for the USS Enterprise.
Falcon Northwest Mach V FX-51	11/2003	9	AN Athlon 64 FX-51, GeForce FX 5950 Ultra, and 8x Plextor drive make the new Mach V a technology showcase.	The machine could use much more bulk storage for multimedia sundries.

Product Name	Issue Reviewed	Rating	Pro	Con
FIC Condor	07/2004	9	Extremely quiet and easy to work in.	The slick external finish scratches easily.
FIC Ice Cube IC-VL67	02/2004	8	Solid, reliable offering that's dent-resistant.	Doesn't offer SATA support.
FIC Ice Cube-VG61	07/2003	9	Stylin' case, nice mix of front and rear ports.	Obnoxiously loud systme beep. More air venting would be nice for piece of mind. Styling may be too flamboyant for the "Murder She Wrote" crowd.
Fujitsu Lifebook P5020D	02/2004	9	Zoomy little Pentium M and crazy battery life.	Integrated graphics and teeny, tiny keys.
Hewlett-Packard Pavilion ZD7000	01/2004	9	Top-end nVidia graphics part, 3.2GHz Pentium 4, and a 10-key pad.	4,200rpm hard drive.
High Power Computers Hellfire 2	08/2003	8	One fast Athlon XP.	Needs a little more polish, and the configuration is quirky.
HyperSonic SonicBoom	01/2004	9	Pentium 4 Extreme Edition takes charge.	Overclocked CPU means no Intel warranty for your chip.
IbuyPower Batallion-101	07/2004	8	Great performance, good battery life, and crazy-low pricing.	Awful onboard speakers and mushy scroll pad.
IbuyPower Gamer Extreme PC	04/2004	8	3.4GHz P4EE. 'Nuff said.	Single HDD, weak optical drive selection.
IbuyPower RaidCom	08/2003	8	Affordable, good airflow for internal components, conveniently located power and reset switches.	A little flimsy, and sub-par paint job.
IbuyPower Titanium XP	06/2003	9	The 800MHz system bus offers significant performance dividends, and the system is reasonably priced.	There's got to be a better way to close off a disconnected USB port. We also would have gone with a different hard drive and speakers.
Iwill XP4-G	07/2003	7	Simple, clean, light-weight, and inexpensive.	No extras, tricky cable routing, over-sensitive power and reset switches.
Lian-Li PC-6070A Silent Case	09/2003	8	Well-designed layout, great build quality, inaudible case fans.	Not much airflow from case fans. Pricey.
MADLights LED Lighting Kit	08/2003	7	They can turn your rig into a 70s-era space rock concert.	They're just lights.
MaxVision MaxPac	11/2003	7	Slick concept, packed with high-end parts, (somewhat) upgradeable.	Poor cooling design, mediocre sound and speakers, inferior 865 chipset and DDR333 memory, and pricey.
Monarch Computer Systems Hornet Pro	02/2004	9	Expansion galore, removable motherboard tray, and support for most MicroATX mobos.	Not quite as polished as the other contenders, and a little noisy.
Monarch Hornet Pro 64	07/2004	9	A GeForce 6800 Ultra in a small formfactor box!	Athlon 64 trails P4 in application tests.

Product Name	Issue Reviewed	Rating	Pro	Con
MSI MEGA	10/2003	6	The stand-alone media center function is a clever twist.	Benchmarks don't cut it, it runs too hot, and it's cramped.
MSI MEGA 865 Deluxe	06/2004	7	Sweet look and integrated radio.	Media Center software is bug-infested.
OC System	06/2003	4	The case offers massive cooling options, and is unique in a sea of Antec/Chieftec clones.	One of the most unstable machines we've ever been asked to officially review.
Polywell 1100A	10/2003	5	Comes with a good supporting cast of components.	Places third behind P4 and Athlon XP systems.
Polywell 900NF3-FX3	05/2004	9	Great primary performance, blazing performance.	Disappointing secondary components, inconsistent quality.
Screamworx Hysteria 64-FX	02/2004	9	Great performance, good build quality, relatively low noise.	Average value for the price.
Sharp Actius RD3D	04/2004	5	Amazing 3D screen.	Road-kill graphics, second-rate Pentium 4, and third-rate hard drive.
Shuttle SB61G2	10/2003	9	Well-designed. Great documentation. Strong performance.	Finicky case cover. Lacking extras, if that's your bag, baby.
Shuttle SN456	11/2003	9	Big performance in a small box, with first-rate fit and finish.	Needs Serial-ATA support and a six-pin front-mounted FireWire port.
Silver Stone SST-LC01	01/2004	7	SGI look, solid construction, good build quality, full ATX accommodations.	SGI look, mediocre ventilation, possible space limitations.
SilverStone Nimiz	04/2004	9	Excellent features, sturdy construction, tastefully appointed.	Magnets that keep the front doors shut are too weak.
Sony VAIO PCG-TR2A	05/2004	9	Good power, fair battery life, and a decent keyboard.	No scroll wheel?
SOYO MiniDragon 651	10/2003	6	Full AGP support in a tiny box.	Too many problems to mention in this tiny space.
Startech Aluminator	01/2004	6	Motorized door, ample internal room, power supply included.	Tacky construction, overpriced.
TAC Ridiculously Insane AMD64	12/2003	9	Smoldering performance, three-year warranty.	Tacky Velcro tabs on the case door, second-best videocard, fugly overall appearance.
Thermaltake Xaser III	08/2003	9	Solid construction, feature laden, tons of fans.	Design may appear tawdry to some, and it's got enough fans to drive Steve Jobs insane.
Thermaltake Xaser V Damier V6000A	07/2004	9	Well-made, plenty of cooling, and easy access.	Thermaltake logo plastered all over the case, and lighting is overdone.
Toshiba Satellite P25-S607	10/2003	9	Solidly built. Boasts dual-channel memory. The big screen is a joy on the eyes and great for movies.	The FeForce FX Go5200 is too slow for a notebook of this stature.

Product Name	Issue Reviewed	Rating	Pro	Con
Toshiba Satellite P25-S609	04/2004	7	Good application performance, beautiful 17-inch display, and solid feel.	Lackluster gaming performance almost makes it illegal to call this a "multimedia" computer
Toshiba Satellite Pro M15-S405	09/2003	8	Mega battery run-time, good audio.	Could be slimmer and lighter and sport a better screen.
Velocity Micro ProMagix	06/2004	9	Incredible performance, fantastic storage options.	No significant progression in system design or component choice.
Velocity Raptor Special Edition	08/2003	9	Top-dog performance, a Kubrickian case design, and cutting-edge components.	Forty-six hundred dollars and it doesn't even include a HAL-esque light on the front?!
Vicious Assassin Special Edition	03/2004	9	Beautiful, fast, and fairly priced.	Annoying hex screws that won't stay tight, 4x DVD burner.
Voodoo Envy M:855	04/2004	8	Great battery life—and it's sporting 64-bit computing.	Gimpy 1x DVD-R/RW drive and last-gen graphics card sully an otherwise attractive product.
Voodoo Rage f50	05/2004	9	Performs well and is damn-near silent, even when playing games or running benchmarks.	The system is heavy, difficult to upgrade, and requires extra attention.
Xoxide UV Reactive Case	09/2003	6	Cool UV-reactive clear acrylics, ample drive bays and fan mounts.	Fragile as a little buttercup—our review unit was cracked on arrival.

Software and Online Services

Product Name	Issue Reviewed	Rating	Pro	Con
3D-Album	04/2004	6	See your digital images mapped onto a 3D object.	Tacky 3D effects, too few options, clumsy interface.
Acronis True Image 6.0	06/2003	9	*True Image* addresses the two major failings of other drive-imaging products—poor support for external drives, and the need to reboot at least once or twice.	No tech support by telephone? Not even some ex-con with a princess phone and the manual?
Adobe Encore DVD	12/2003	9	If you want to make pro-level DVDs, *Encore* is worth every penny.	A handful of minor issues needs attention. Some media files are inexplicably rejected.
Adobe Photoshop Album	07/2003	8	Easy to use, and includes an amazing breadth of features intended for budding digital photo collectors.	Lacks image management features we can't do without.
Adobe Photoshop CS	03/2004	9	The most comprehensive update to *Photoshop* yet, and native RAQ file format for digital images.	Recognition of rotated image data can get whacky. It's still a pricey piece of software.

Product Name	Issue Reviewed	Rating	Pro	Con
Age of Wonders: Shadow Magic	09/2003	9	An immersive campaign and an innovative blend of RPG and turn-based gameplay.	Not for casual gamers. Our longest session lasted an ass-numbing seven hours.
Aquanox 2: Revelation	11/2003	5	Large battles are fun; good sounds/music.	Way too much dialogue, unimaginitive missions, no in-mission save.
Armed and Dangerous	03/2004	7	Clever weapons, funny story, and nice-looking graphics.	Linear and repetitive gameplay, and not enough use of fun weapons.
Arrowkey CD/DVD Diagnostic	03/2004	8	Hell, we're amazed it could read even a portion of our slashed up discs.	Can take more than an hour to recover the data; the interface looks like a shareware Visual Basic app.
AVG Anti-Virus	03/2004	9	Detected all test viruses, and did a full system scan in the same time as the other apps. Plus, it's free!	Doesn't include any bells and whistles such as spyware scanning, but it's free!
Azio MP3 Player/USB Key	07/2003	7	The MP306 is the smallest MP3 player we've ever seen that includes an LCD display.	Cheap build quality, no option for memory expansion, and requires special software (included) to reformat the drive, should that ever be necessary.
Battlefield 1942: Secret Weapons of WWII	11/2003	8	New objective mode is cool, and new maps and weapons help give this warhorse new life.	Some weapons are too silly, and there's still no easy way to shoot down planes.
Battlefield Vietnam	06/2004	8	Love the realistic in-vehicle radio, and the new vehicles kick ass.	Some classes are badly over-powered. Where's the realistic foliage?
Beyond Good and Evil	04/2004	9	Interesting story, great characters, lots of fun action elements.	Confusing inventory-management system, console-based menus.
BlackIce	07/2003	7	Solid diagnostics of incursions. Thorough documentation.	Looks ugly. Not recommended for casual desktop users.
Call of Duty	01/2004	9	Well-balanced, unique weapons, a breathtaking single player, and outstanding attention to detail.	We have only minor gripes. It's that good.
Chaser	11/2003	8	Almost nonstop action throughout, lovely graphics and lighting, and a psycho's toy box of weapons.	Smarter cooperative AI would have been better. There's no lean feature to look around corners.
CorePROTECT CoreRESTORE	09/2003	7	Exceeds the protection level of software-based solutions.	Consumes half a drive, and lowers overall drive speed.
Counter-Strike: Condition Zero	04/2004	6	Nice tune-up of a classic game.	Totally unnecessary—and fun-fun—addition of the Deleted Scenes campaign.
CSI: Crime Scene Investigation	07/2003	4	All the regulars from the television show are voiced by the television actors.	Maybe they should've taken a pass on this dull, obligatory effort to create an interactive version of the show.

Product Name	Issue Reviewed	Rating	Pro	Con
Deus Ex: Invisible War	02/2004	9	Do-anything-you-want gameplay makes *Invisible War* a must for any real PC gamer.	Interface issues annoy, but don't spoil *Invisible War*.
DtSearch Desktop	09/2003	8	Will find a needle in a haystack.	Takes forever to index large amounts of data, and the interface looks dated.
DVDXCopy XPRESS 3.0	11/2003	9	Lets you decide what can stay and go in your movie dupes.	Compression can ruin playback quality.
Easy CD & DVD Creator 6	10/2003	9	Now comparable to Nero in terms of burning speed, it's also one-upped Nero with a graceful interface, a fine media player/ripper, and overall stability.	There are no DVD menu customization options beyond changing the text—and the templates are tacky.
Empires: Dawn of the Modern World	01/2004	9	Two different play modes, truly distinct civilizations, and amazing graphics.	Camera control could be more flexible.
Far Cry	06/2004	9	Awesome graphics, superb AI, fantastic weapons, and intense gameplay.	Wonky vehicle controls, and multiplayer is as yet unproven.
Forward Solutions Migo	12/2003	7	Transports your PC's look and feel to other computers, robust software implementation, password protection.	Slow transfer speeds, pricey.
Freelancer	06/2003	9	A large, fully-realized universe. Smooth, effective interface.	Not a true "sim," and thus not as complex as something like *Independence War*.
Grand Theft Auto: Vice City	07/2003	7	Motorcycles kick ass, and there are plenty of fast cars, boats, and bikes to jack.	Too much time spent driving across town for meaningless errands.
Halo: Combat Evolved	12/2003	7	Entertaining single player, novel shield/health system, and fun multiplayer with vehicles.	Essentially unchanged from the Xbox version, and slower to boot.
Homeworld 2	12/2003	9	Interface and control improvements have made managing epic battles easier. Gorgeous graphics.	Three-dimensional tactics might be tough for some gamers.
Hoyle Majestic Chess	11/2003	9	The adventure aspect actually makes chess fun.	Adventure becomes too difficult early on, and there's occasional lag.
Hulk	09/2003	7	You get to run around as the Hulk and break things.	Unoriginal, simplistic, and linear.
IcopyDVDs2	05/2004	8	Low-cost and easy to use.	Doesn't work unless you download extra components from the Internet.
Indiana Jones and the Emperor's Tomb	06/2003	7	Pulling off a spectacular knockout combo will make you feel young again.	Console busywork and a patented NauseaCam makes getting to the good stuff a chore.
Itunes	01/2004	8	N/A	N/A

Product Name	Issue Reviewed	Rating	Pro	Con
Jurassic Park: Operation Genesis	07/2003	7	The only thing more fun than creating a park full of dinosaurs is unleashing these dinos on your unsuspecting guests.	Annoying crash bugs and a very short tech tree.
Lords of EverQuest	04/2004	4	It doesn't crash. Much.	Routine and bland, with rotten unit AI and controls.
Manhunt	07/2004	6	The initial levels are an orgy of suspense and violence.	Repetitive play mechanics and subpar AI.
Max Payne 2: The Fall of Max Payne	01/2004	8	Better graphics, fewer puzzles, same "Hollywood" feel.	Too easy, little to no replayability.
MaxiVista	06/2004	8	A cheap way to run two or three monitors.	Lack of hardware acceleration makes secondary windows slow.
McAfee VirusScan 2004	03/2004	6	The software will adequately protect you.	Annoying ads and a poorly designed interface. Only one year of virus updates, after which you'll be haunted endlessly to renew.
MediaRecover	03/2004	9	"Keep it simple, stupid" interface does the job in 99 percent of cases.	Could use a few more hardcore features.
MemoriesOnTV 2.0	04/2004	8	Fantastic Ken Burns Effect and amazing ease of use.	Handling of audio needs to be improved, and more transitions would be welcome.
Microsoft Internet Explorer	11/2003	7	It's fast, reliable, and works with every web page we've ever visited in the last three years.	A day browsing on *IE* leaves us jonesing for tabs and a pop-up blocker. Malicious *ActiveX* applets suck.
Microsoft Office Professional Edition 2003	06/2004	9	Packed with tons of features and useful apps, and it's easy to use.	Expensive, and a bit too feature-rich for basic use.
Microsoft Windows Mobile 2003	12/2003	9	All the basics are covered and the fancy multimedia stuff works great too!	We hate how difficult it is to get to the notepad, but the rest of the package is very compelling.
Midnight Club II	10/2003	9	A fun racer that requires lightning-quick reflexes and a keen eye for the road. Nonlinear gameplay.	Trashing cars from the real world would be more fun, but we haven't seen any wacky names, like Modo Prego.
Mozilla Firebird 0.6	11/2003	9	Tabbed browsing, pop-up control, and no annoying *ActiveX* applets are all reasons to love *Firebird*.	*Firebird* still crashed occasionally, and it's not as fast or compatible as *IE*.
MSN Hotmail	03/2004	7	Sanity-protecting spam filter is a bit cranky, but stops the bloat.	Relatively mediocre search, stingy inbox capacity, and occasionally slow delivery rates.
MusicMatch Downloads	01/2004	6	N/A	N/A
MyDVD Studio Deluxe	12/2003	7	Spectacularly easy to use, and offers fancy DVD authoring features for the lowest-end price.	Buy this suite only if you don't already own a good CD burning app and software DVD player.

Product Name	Issue Reviewed	Rating	Pro	Con
Napster	01/2004	8	N/A	N/A
Nero Ultra Edition	10/2003	8	*Nero*'s still a great burning app that power users will appreciate, with lots of customization options for DVD menus and a strong backup utility that can be scheduled.	The interface is taking a dive, and the boxed version desperately needs to be patched. And what's with the extra fee for MP3 encoding?
Norton AntiVirus 2004	03/2004	8	Killing viruses is old hat, but getting rid of spyware at the same time makes us grin.	Activation is a pain, only one year of virus updates, after which you'll be haunted endlessly to renew.
Norton Personal Firewall 2003	07/2003	8	Good update support, fine documentation.	Quirky interface.
OpenOffice.org 1.1.1	06/2004	7	For basic productivity duties it does a good job. And it's free.	Slow, and not as feature-rich or easy to use as *Microsoft Office*.
Painkiller	07/2004	9	Malicious rag-doll physics and luscious textures amplify *Painkiller*'s relentless dosages of action.	Simple play mechanics, with bulky load times and multiplayer kinks.
Palm OS 5	12/2003	8	A clean interface and easy access to basic apps are Palm hallmarks.	The Palm OS isn't taking full advantage of the available hardware yet.
PhotoStory on CD & DVD	04/2004	8	Excellent audio capabilities and MPEG encoder.	Doesn't let you control panning or zooming.
Planetside	08/2003	6	Some innovative design concepts (rank, training, anti-griefing rules) add significantly to the FPS formula.	Spotty performance. Definitely requires a broadband connection.
Plumb Design Visual Thesaurus	10/2003	8	Offers loads of information in a dynamic, nonlinear format.	Can be a bit overwhelming and unwieldy with all its capabilities enabled.
PowerDVD 5 Deluxe	11/2003	9	Eagle Vision image enhancement rocks; tons of audio features.	No automatic chapter-name download; poorly-designed user interface.
Prince of Persia: The Sands of Time	03/2004	9	Intriguing puzzles, superb combat, and stylish good looks.	Fixed camera can be annoying in tight spaces.
Rainbow Six 3: Raven Shield	06/2003	8	Classic tactical team-based gameplay. A good selection of multiplayer modes with stable net code. The best-looking game in the series.	Piddling storyline. Inconsistent AI.
Rhapsody	01/2004	9	N/A	N/A
Rise of Nations	07/2003	10	Innovative gameplay and a great-looking 3D engine make this more than another *Age of Empires* clone. *Conquer the World* is da bomb!	Ultimately, it's just an RTS.

Product Name	Issue Reviewed	Rating	Pro	Con
Roxio Easy CD Creator 7	07/2004	9	Huge, comprehensive suite of excellent products behind an effortless interface.	"Fit to Disc" feature is not user-tweakable, and some apps are slow to launch.
Savage: The Battle for Newerth	12/2003	8	Nice blend of FPS and RTS, huge battles, lots of action.	No official training, and near-impossible to be a commander.
Secret Weapons Over Normandy	02/2004	6	Slick presentation and lotsa shootin'.	The overly simplistic arcade action isn't very engaging.
SimCity 4: Rush Hour	12/2003	8	A staggering number of transportation options are available to the *SimCity* veteran.	This expansion is narrow, but deep. If adjusting traffic patterns doesn't sound like fun, skip this one.
SnapStream Personal Video Station 3	08/2003	9	Once configured, *PVS3* provides users with an interface that's visible from up to 10 feet and easily controlled using a remote control. Streaming video to other PCs is extremely cool too!	This isn't the easiest software in the world to configure, and we'd like to see a smarter recorder that intuits a viewer's likes and dislikes and pre-records suggested programming, just like TiVo.
Splinter Cell: Pandora Tomorrow	07/2004	8	If you dug the original, you'll love *Pandora*.	Single-player is the same as the fire game.
Star Trek Elite Force II	09/2003	8	Superior to the excellent original *Star Trek Voyager: Elite Force* (not to mention longer).	Weapon design is uninspired. And where are the bump-mapping and shader effects?
Star Wars Galaxies: An Empire Divided	10/2003	6	An awesome recreation of the *Star Wars* universe with superb	graphics and a solid interface. Quickly becomes repetitive. Missing key features, such as vehicles.
Star Wars Jedi Knight: Jedi Academy	12/2003	8	Killer saber duels, good mission variety, great single- and multiplayer action.	Not enough training, and the vehicles are hard to control.
Star Wars: Knights of the Old Republica	02/2004	10	*KOTOR* lets you feel like a Jedi for the first time, instead of the *Doomguy* with a light saber.	Backtracking gets to be a hassle near the end of the game, but the reward is worth it.
Steganos Security Suite Generation 6	02/2004	9	Steganos bundles a lot of security and encryption features into a single, easy-to-use package.	Safe doesn't clone automatically, and files copies to Safe must be deleted manually from their source.
Syberia 2	05/2004	7	A deeply involving game with a fantastic story.	Still, it's a conventional point-and-click game bugged down by frustrating pixel hunts and busywork.
Tiger Woods PGA Tour 2004	01/2004	9	The best of its genre—ever. Career mode play offers best replay value of any gold fame—ever.	Ugly NPC's, slow tournament play, and a bug that denies use of the putter.
Tron 2.0	10/2003	8	Compelling storyline, good episodic play, innovative character development, rocking visual and audioscapes.	AI is either too hard or too soft.

Product Name	Issue Reviewed	Rating	Pro	Con
Tropico 2: Pirate Cove	08/2003	7	An effective and generally entertaining economic and city building game.	Some game elements are an uneasy fit with the original *Tropico* gameplay.
Unreal Tournament 2004	06/2004	9	Tons of content, tons of fun.	Outdated graphics.
Will Rock	09/2003	6	Plenty of weapons and enough enemies make *Will Rock* entertaining for a few hours.	Intro tricked us into thinking this game had a story, but the plot was gone after 20 seconds.
WinDVD 5 Platinum	11/2003	8	Good basic functionality; tons of audio features.	No automatic chapter-name download; poorly designed user interface, lacks PowerDVD's extras.
XIII	02/2004	7	Cartoon FPS concept is interesting, aesthetic is stylish, and the soundtrack is great.	No "real" saves—only checkpoints; annoying disc swapping, and repetitive gameplay.
Yahoo! Mail	03/2004	8	Copius space and serious features.	Disappointing spam filter.
ZoneAlarm Pro	07/2003	9	Solid work ethic after setup is complete; great explanations and documentation.	

Handhelds, Cameras, and Misc. Devices

Product Name	Issue Reviewed	Rating	Pro	Con
Apple 30GB iPod MP3 Player	09/2003	10	The very, very best MP3 player we've ever used. If only all our music was this good.	High-priced and the bundled *MusicMatch Jukebox* restricts MP3 recording to 128kbps.
Archos AV320 MP3/ Movie Player	08/2003	8	No doubt about it—the versatile AV320 is the sexiest gadget in the neighborhood. Movies on the go are the Next Big Thing.	Wildly expensive. Teeny viewable angle. Our own DivX files still needed to be re-encoded by the bundled software before they would play on the AV320.
Bantam BA-800 MP3 Player/Image Viewer	08/2003	5	256MB is a nice helping of internal memory for a solid-state player, and it's true that our current MP3 players can't display color pictures.	Our current MP3 players don't paint our toenails either—we don't need them to. Plus, this puppy is huge.
Belkin Bluetooth GPS Receiver	03/2004	9	Inexpensive, voice-prompting wireless GPS without monthly fees.	Depsite a "high-sensitivity" mode, we still lost the GPS signal in some covered areas.
Belkin Media Reader for iPod	01/2004	7	Belkin's Media Reader is an extremely clever way to make the most of all that space on your iPod.	It's too slow, can't be used as a PC media reader, and is much bigger than it needs to be.
Canon PowerShot S400	08/2003	10	Impressive image-quality, great performance, small size, best-in-class feature-set for prosumer types.	Not much.

Product Name	Issue Reviewed	Rating	Pro	Con
Cd3o c300 Network MP3 Player	01/2004	9	Excellent sound quality, uncompressed audio support, very good software.	A little pricey when compared to other products on the market; RCA connectors should be deeper.
Creative Labs MuVo TV	05/2004	9	Ooodles of flash storage, USB 2.0 support; a new high for solid-state MP3 players.	Memory isn't expandable. The usual crappy earbuds.
Creative Labs Nomad Zen NX	11/2003	8	Creative Labs offers another sturdy, utilitarian MP3 player with tons of storage at a fine price.	It's still light-years behind the features and ease-of-use of the iPod. Catch up, folks.
Deja View Camwear	07/2004	3	It does, in fact, record the last 30 seconds of your life, as advertised.	It's awkward, uncomfortable, and unbelievably expensive.
Dell Digital Jukebox	01/2004	8	Great sound and beefy volume in a small, handsome package.	The firmware could use an update, and *MusicMatch* has got to go.
Digital Personal U.are.U Pro Workstation	09/2003	9	The U.are.U Pro has everything we want in a biometric security device.	Unless you're really, really concerned about data security, $150 is a lot for most users to spend.
EDGE DiskGO! USB Watch	10/2003	7	Slick concept, and we love being able to carry data on our wrists.	Limited timekeeping functionality. USB 1.1 transfer speeds. Slightly uncomfortable to wear.
Fujitsu Lifebook T3010 Tablet PC	05/2004	7	Editing "pen and ink" notes kicks ass. Combination of Notebook and Tablet features rocks.	Handwriting recognition sucks, and the speakers are underpowered.
Gateway 256MB MP3 Player	01/2004	6	The curvaceous design is a pleasure to hold, and the 10-band EQ rocks.	The DMP-300 simply doesn't get loud enough for our tastes.
HP iPAQ 5450	06/2003	9	Sturdy construction, beautiful transflective screen, and includes just about every option imaginable.	A little bit hefty, and definitely expensive.
Iogear MiniView III USB KVM	03/2004	8	Works as advertised, without degrading image quality or adding keyboard wonkiness.	The spare USB ports on the back should be swapped with the keyboard and mouse ports up front.
Ipod Mini	06/2004	9	The iPod Mini—amazingly—is an improvement over the dazzling original.	Capacity is limited to 4GB, and you don't get a sassy-looking dock.
Kyocera FineCam SL300R	03/2004	7	Slim, attractive, and takes great daylight images.	Flash is too powerful, and the swivel design makes it too easy to get fingerprints on the lens.
Logicube Solitaire Turbo	09/2003	8	Compact and powerful, gets the job done with little fuss, easy to use.	Limited utility for a high price. Additional functionality is expensive.
Logitech QuickCam Orbit	07/2004	8	Deeply cool-looking design. Effective image-tweaking controls. Integration with many IM services.	Neither remote control nor remote surveillance paranoia-ware is included.

Product Name	Issue Reviewed	Rating	Pro	Con
Lyra RD2780 Audio Video Jukebox	07/2004	3	Retailers often allow up to 30 days for returns.	Some don't.
Micro 2000 Universal Diagnostic Toolkit	10/2003	7	Lets you easily test for problematic power. Useful software diagnostics. Everything works as advertised.	A POST card is of limited use with modern mobos. Extremely expensive.
Mojo 256F	05/2004	5	Thin and light, with buttons conveniently arranged on one side of the player.	Must be used with a proprietary cable, doesn't show up in *Explorer*, and more.
Neuros HD 20GB MP3 Player	06/2003	6	The modular design is a great concept, and we appreciate the extra helping of features.	Great concepts need great execution. The Neuros HD 20GB didn't get it.
Nikon D70	06/2004	9	Incredibly fast performance and 1/500 sync speed.	Noticeable moiré, and unable to easily change autofocus modes.
Olympus Stylis 400 Digital	08/2003	8	Good ergonomics, excellent construction, good image-quality, good battery endurance.	No ability to focus in the dark. Minimal features and user control. Storage limitations.
Palm Tungsten C	08/2003	9	Awesome battery life even when using Wi-Fi.	A little hefty and lacks a microphone and quality onboard speaker.
Palm Tungsten T3	01/2004	9	Tiny and powerful, and contact info now tracks birthdays and instant messaging.	Sticky power button.
Palm Zire 71	08/2003	9	The light weight of the unit makes it easy to carry this camera-equipped PDA everywhere.	More base RAM would be welcome, and we'd like true multi-tasking in the OS.
Rio Nitrus MP3 Player	11/2003	6	Sturdy, and roomier than solid-state devices, and the bundled Sennheiser MX300 earbuds are the best.	The software is first-generation, data transport is awkward, and the price is challenging.
SiPix StyleCam Blink 2	08/2003	6	Fun, innocuous, neato.	Bad image quality; video feature is silly.
Sony Clie PEG-NX80V	10/2003	8	Beautiful fit and finish. Great features. Good software bundle.	Lacks built-in wireless support. Needs more RAM.
Toshiba e805	03/2004	9	Enough hardware muscle for games and video, and the exclusive VGA mode is breathtaking.	Optimum VGA requires a third-party hack; very expensive; frustrating button lag.
Treyonics Devastator II	01/2004	9	This great-looking cabinet holds the power to play nearly every arcade game ever made.	The price is hefty at $400, but we can forgive that, given the included $100 trackball.
Upgradeware XP-TMC CPU Upgrade	10/2003	8	BIOS independent. Supports all multiplier settings from 5x to 24x. Leaves CPU without tell-tale scars.	Doesn't unlock the CPU. Costly and potentially tedious.

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